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CONTENTS.

I. New Genera and Species of Fossils from the Niagara Shales. By EUGENE N. S. RINGUEBERG, ... 5

II. Fossils from the Waterlime Group Near Buffalo, N. Y. By JULIUS POHLMAN, M. D. 23

III. Nidification of Birds on the St. Clair Flats. By J. H. LANGILLE. 33

IV. Nonagria subcarnea, n. s. By D. S. KELLICOTT. 40

V. Hydreomena traversata, n. s. By D. S. KELLICOTT. . . 45

VI. The Gape Worm of Fowls (Syngamus trachealis); The Earthworm (Lumbricus terrestris) its Original Host. Also, On the Prevention of the Disease in Fowls called the Gapes, which is caused by this Parasite. By H. D. WALKER. 47

VII. Ventriloquial and Imitative Powers of Birds. By E. E. FISH. 72

VIII. Notes on the Fossil Fishes of the Genesee and Portage Black Shales. By HERBERT U. WILLIAMS. 81

IX. Fish Remains from the Corniferous, Near Buffalo. By FRED. K. MIXER and HERBERT U. WILLIAMS. 84

X. Native and Naturalized Plants of Buffalo and its Vicinity; Second Supplement. By DAVID F. DAY. . . . 85

XI. The Thickness of the Onondaga Salt Group at Buffalo, N. Y. By JULIUS POHLMAN, M. D. 97

XII. The Mills Collection of Fresh-Water Sponges. By DAVID S. KELLICOTT, Ph. D. 99

XIII. List of the Macro-Lepidoptera of Buffalo and Vicinity. By EDWARD P. VAN DUZEE. 105

XIV. A List of the Hemiptera of Buffalo and Vicinity. By EDWARD P. VAN DUZEE. 167

XV. Descriptions of Some New North American Homopterous insects. By E. P. VAN DUZEE. 205

XVI. The Pendulum and its Laws of Oscillation. By AUSTIN M. EDWARDS. 217

XVII. A Preliminary Review of the North American Delphacidæ. By E. P. VAN DUZEE. 225

General Index. 262

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BULLETIN

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VOLUME V. NO. 1.

I. NEW GENERA AND SPECIES OF FOSSILS FROM THE NIAGARA SHALES.

BY EUGENE N. S. RINGUEBERG.

SQUAMASTER (N. Gen.).

Body small. Rays long, slender, tapering, flexible, and divided into annular segments.

Ventral side of ray with two series of paired, opposite ambulacral plates, divided by a straight median line; they are irregularly sub-quadrilateral, with one short side, and are arranged in pairs in each series, so that two long and two short sides are joined alternately, consequently there is a long transverse suture regularly alternating with a short one. This disposition gives dentate lateral margins to the ambulacral series. The lateral ends of the long transverse sutures curve away from each other, leaving a small notch between the inferior plates of each pair and the superior plates of the adjoining pairs. This notch receives the inner lateral corners of the squamose dorsal plates. Between the dentate elevations of the ambulacral plates and the lateral margins of the dorsal plates there are large triangular openings, which constituted, or in which were placed the pores.

Dorsal side composed of large, quadrangular, squamose plates, that encircle the arm as far as the ambulacral groove of which they form the margin. They are divided in the upper portion of the ray by a median suture.

Dorsal, ray plates fimbriated on the free margins.

All plates are perforated by minute, closely arranged pores.

SQUAMASTER ECHINATUS (N. Sp.). Pl. 1, fig. 1.

Body small. Rays long, slender, not widening at the base; regularly tapering to a sub-obtuse point. Dorsal side covered by thin imbricating plates, with free external margins which are edged on the outer and lateral sides with closely arranged, long, slender, filiform spinules, that articulate into minute rounded sockets, which are scalloped out of the margin of the plate; they are slightly longer than the exposed portion of the plate, and are placed about their own diameter apart.

Ray divided into about forty segments or articulations by the encircling, dorsal plates; these grow rapidly narrower near the body, and are divided by a dorsal suture running along a raised median ridge which extends about two-fifths of the length of the ray from the body out, where it gradually disappears with the last divided plate; the rest are entire. These plates are quadrangular, and have their inner corners articulated into the socket formed in the dentate lateral extensions of the ambulacral series. They are ornamented on each side by two or three closely arranged, sub-parallel, very fine ridges, that commence near the dorsal line at the free margins and extend diagonally backwards across the plate towards the inner lateral articulated corner. Ambulacral groove furnished with opposite, irregularly quadrilateral, ambulacral plates, divided by a median suture which is crossed alternately by one long and one short suture.

The superior plate of each pair has the greatest extension laterally, while in the inferior it is the direction of the median line, it being about twice as long as the superior, which, however, is but slightly broader.

Between the lateral margins of the dorsal plates and the dentate elevations of the ambulacral plates are large sub-trigonal open spaces.

The plates are punctured by very closely arranged minute perforations.

The specimen from which this description is taken has three arms nearly perfect, with a small fragment of the body attached.

PROTASTER STELLIFER (N. Sp.). Pl. 1, fig. 2.

Disk of medium size, flat, circular, slightly flexible, distinct from the rays on the dorsal side, and has on that side a quinquedentate, stellate, central elevation, which again has a central, stellate depression of about one-half the lateral extension of the stellate elevation upon which it is impressed. The points of the star-like figure are opposite the several rays and extend about two-thirds across the disk.

Surface finely granulose. Rays slender, almost imperceptibly tapering in the upper half of their known length; rounding on the dorsal side, with two rows of regular, quadrilateral, alternating plates which can with difficulty be made out, and which have a fine granulose surface resembling the surface of the disk; opposite each transverse suture there is a corresponding linear depression across the surface of the opposite plate on the other side of the median suture, which at first sight gives the impression that the ray is composed of opposite plates of only one-half the real length.

Ventral side with ten short, oral plates which are slightly separated below, and meet at the discal surface, where they are rounded.

Ambulacral series long, regularly quadrilateral; alternately arranged.

Adambulacrals indistinct in the only specimens found showing the ventral surface.

Marginal series slightly imbricating; spiniferous; spines rather short.

Three specimens have been obtained.

EUGASTER CONCINNUS (N. Sp.). Pl. 1, fig. 3.

Disk flat, thin, alated, composed of very fine granulose plates. Rays broad at their base; flattened, rapidly tapering for two-thirds of their length; terminal third attenuate, rounded; plates, if any, undefinable.

Dorsal side with four series of plates: two median and two lateral; the transverse sutures dividing the outer series are continuous with every other transverse suture dividing the central series. Medial series with twice the number of plates of the outer, and are raised above them.

Sutures depressed. Surface of the plates rounded and finely granular.

The lateral series of plates decrease regularly in size after reaching the disk until they end in a pronounced elevation formed by the last pair of the medial series at a point about half way from the border towards the center of the disk—measuring at the narrowest part—where both series end. Between these elevations the disk has a shallow, stellate depression with the points opposite the several rays. The two outer rows of plates apparently disappear towards the attenuate tip before the median does so. The imperfect cast of the upper part of one of the rays is all that is known of the ventral side; this shows traces of an alternating series of ambulacral plates.

Marginal plates spiniferous.

Length of ray one-half inch.

This species agrees with the genus *Eugaster* in general form, in the alate and granulose character of the flat disk, and in the alternate arms.

LECANOCRINUS SOLIDUS (N. Sp.). Pl. 1, fig. 4.

Calyx funnel-form, evenly tapering from the arms to the base, which is just the size of the column on which it rests. Column large, massive. Arms wide. Entire surface granulose.

Basal plates three, large, angles normal in number, upper angles obtuse; sub-radials five, medium size, about as high as wide; intercalated plate regularly quadrangular, somewhat oval in out-

line; interradial plate large, equiform, long, broad at the base, rounding by slight angles to a conical apex at the top; first radials wide, one-half as high as wide; second and third radials low and wide; the third presenting a slight angle in the first bifurcation of the arms which again divide at about the third plate, as far as can be observed. Arms resemble those of *L. macropetalus*. Column made up of various sized joints, which are from one-eighth to one-fiftieth of an inch in height; these joints are rounded out slightly, and some of the larger ones seem to have been formed through the anchylosing of two or more joints.

This species is readily distinguished from *L. macropetalus*, which it resembles in the position of the plates and arms, by the funnel-form calyx, the larger basal plates, which form a cup-like shape instead of the platter-like disposition which they have in the other, and its large base and column, which has more than twice the proportionate diameter of the other.

From the lowest band in the shale.

LECANOCRINUS NITIDUS (N. Sp.). Pl. 1, fig. 5.

Calyx bowl-shaped, with a small, flat base; upper part incurved at the radial sutures.

Column slender; uniform in size, rather short; terminating in a palmate, adherent root.

Arms rapidly tapering, rounded externally.

Basal plates extending at right angles from the column for one-third of their height, and are then abruptly bent upwards at an obtuse angle; sub-radials somewhat wider than high; intercalated plate quadrangular, small; interradial plate high and narrow, about three to five; lower angle placed to the left of the median line, rounded obtuse above; first radials wider than high, about three or four to five; of unequal sizes, prominent in the center and are evenly rounded inwards at the sides, forming sharply defined sutures; upper side evenly curved downwards from the upper lateral angles; second and third radials free, wide and low, proportion one to four; third radial pentagonal, rising to a sub-obtuse angle in the center, at which point the

arms bifurcate at a slightly divergent angle; they bifurcate again after the third or fourth, and again after that at from the seventh to tenth joint; terminations attenuate.

Column composed of various sized joints, which have a tendency to an alternate arrangement of long and short joints; they are barely narrowed at their juncture, which is strongly dentate.

Root palmate, unjointed.

Growing on a *Fenestella*.

LECANOCRINUS INCISUS (N. Sp.). Pl. 1, fig. 6.

Calyx cup-shaped, rapidly expanding; sharply notched on the upper margin at the junctures of the first radials; base with a slight depression to receive column. Arms rounded externally, scarcely tapering except by bifurcation.

Column slender, nodose, slightly tapering downwards in the upper third.

Basal plates flexed downwards and then upwards, forming a depression for the column; sub-radials about as wide as high, the three on the anterior side being pentagonal and nearly equilateral; intercalated plate small, irregularly quadrilateral; radials large; height to width about four to five; lateral upper angles,—except the left upper angle of the one to the right of the anal plates,—truncate and slightly incurved, forming small V-shaped notches in the rim of the cup-like calyx; anal notch formed between the interradial plate and the adjoining radial to the left; after the first there is a second and often a third free radial, the last of which has a well defined dentate projection in the center, which is about as high again as the plate at the outer margin; these are wide and low, about one to four or five, and are as wide at the base as the distance between the notches in the first radial series. Arms bifurcate again after the fifth or sixth joint, and in one arm eight more joints can be counted without further subdivision. Column composed of joints with a projecting, rounded, ring-like annulation that is about two-thirds as high as the length of the joint in the upper part; these

gradually merge into the joints of the lower end, which are but slightly rounded, and are about as wide as long; surface of plates quite smooth.

LECANOCRINUS EXCAVATUS (N. Sp.). Pl. 1, fig. 7.

Calyx small, cup-shaped, with a shallow groove of the width of the radial plates extending around the body; base large, depressed, forming an inverted cup slightly larger than the column.

Arms long, stout, divergent at the bifurcations.

Column large at its upper end, from which point it tapers for one-half of its length, beyond which it is of even thickness, terminating in a tapering root which throws out lateral rootlets at irregular intervals. Basal plates low and wide, about one-half of their height projecting beyond the rim of the inverted cup which they form; sub-basals about as high as wide, and are quite regular in their formation on the anterior side; intercalated plate quadrangular, of medium size; first radials wide and low, about two to one; upper sides curved downwards, and are bent inwards along their central lateral diameter, forming a wide, shallow, trough-like depression around the upper part of the calyx, which follows the downward curvatures of the plates in which it is placed; interradial plate long, projecting slightly above the first radials; second radials free, wide and low, about four to one; third radials of about the same size as the second, except that they are elevated into an obtuse, upper, central angle; above this the arm-joints bifurcate; the first lateral pieces being joined by a median suture, above which they are free; they again subdivide at about the fourth joint in the same manner, the first plates being united by a median suture.

Column composed of irregular joints, with projecting rounded margins.

LECANOCRINUS PUTEOLUS (N. S. P.). Pl. 1, fig. 8.

Calyx bowl-shaped; base small; outlines slightly angular; surface finely granulose; column and arms unknown.

Basal plates large, the two anterior each having two pits or depressions on their surface, and the posterior having one; subradials rather flat, which gives a pentangular character to the lower part of the calyx, regularly pentagonal on the anterior side, with shallow depressions or circular pits, which are placed near the angles of the plate, and generally correspond in number to the angles; first radials are large, with a straight upper side, and are pitted at the lower corners; intercalated plate large, regularly quadrangular. All the plates seem to be anchylosed.

About three-fifths of the calyx is preserved in the only specimen thus far found.

PLATYCRINUS CORPORICULUS (N. Sp.). Pl. 1, fig. 9.

Calyx cup-shaped, column and basal plates unknown. Arms large and long. Radials, five, large, hexagonal, with the two outer upper margins incurved; upper side curved outwards to receive the rounding second radial, which is pentagonal, with the arms branching out from the two upper faces. Arms ten, long, cannot be seen to taper as far as they are preserved; which is one-half inch in the longest; joints one-half as high as wide; width one-sixteenth of an inch, oval in section, with a projecting receptacle on the lateral side of the joint to receive the pinnules; alternating to the right and left with each succeeding joint. Pinnules long near the arms, where they are about three-fourths as wide as the height of the joint to which they are attached, and as long as its width. Radials measure in their widest part one-eighth of an inch.

CALLOCYSTITES TRIPECTINATUS (N. Sp.). Pl. 1, fig. 10.

Calyx oblong, sub-conical, truncate at the base, which is very broad. Arms five, irregular in length, broadening at their base, which apparently covered the entire summit above the third series of plates; they lie in shallow grooves into which they exactly fit; tentacula slender, elongate. Hydrospires, or pectinated rhombs, three; these are single, not paired, as in the allied

species ; and are formed in the sutures by the two adjoining plates. Surface thickly pitted, giving it an undulose appearance; and many of the plates have faint radiating ridges proceeding from the center of the base in the basals, and from the center of the others towards the angles. Basal plates four, large, one pentagonal, one heptagonal, and two hexagonal ; second series eight, one heptagonal, three hexagonal, and four pentagonal ; third series six, three heptagonal, and three hexagonal ; intercalated plate between second and third series quadrangular ; the plates surrounding the intercalated plate are short in the second series and long in the third ; the reverse of this is observed on the opposite side, where the plates of the second series supporting the "anal aperture" and the two upper hydrospires are long, and the third series immediately above are correspondingly short. Hydrospires placed as follows : one between the basal plate, directly beneath, and the plate of the second series to the left of the intercalated plate ; the two others are supported on the right upper margins of the two plates of the second series on either side of the two supporting the "anal aperture ;" and the opposite plates of the third series above ; they are semi-oval in outline, and have strongly reflexed projecting lips, except on the basal side of the lower one, where it is on a level with the surface of the plate ; they are crossed by ten or twelve bars ; each plate bearing a part ; these are at right angles to the sutures which divide them.

"Anal" aperture large, supported by two plates of the second series, and capped by one of the third. Arms five, extending over half-way down over the second series ; the two to the right of the intercalated plate slightly bifid at their lower extremity ; they are furnished with a central groove, and are composed of two irregularly alternating series of plates. Tentacula composed of small, slightly rounded joints.

The apex has been weathered out of the only specimen seen. From the middle part of the shale.

While this species agrees with *C. jewettii* in the number of arms, the relative position of the hydrospires, and the number and ar-

rangement of the plates, it differs in a marked degree by the hydrospires being single, and not paired, as is the case in *C. jewettii*, *Apiocystites elegans*, and allied species; and while I am inclined to think it may be of generic importance, the question cannot be decided until other material is found for more critical determination.

PLATYCERAS LACINIOSUM (N. Sp.). Pl. 2, fig. 1.

Shell involute, slightly compressed laterally, coiled nearly on a plane, forming a little more than one volution, which is free throughout its entire extent, and regularly increasing in size towards the aperture; outer side of volution flattened and separated from the sides by two sharp, lateral carina; the ventral one of which loses its sharpness as it approaches the aperture, where its position only is designated by slight undulation in the reflexed striæ; this flattened space projects sharply beyond the aperture, as far as the width of the flattened portion; it bears upon its surface, somewhat to its upper side, a rather wide, well defined prominent ridge; inner side of volution evenly rounded; ventral side convex; upper side convex towards the inner side and concave towards the outer; aperture curved backwards next to the lateral carinæ, the curvature being broadest and extending further inwards on the upper, and narrower and more sharply defined on the ventral side. Concentric striæ fine, and closely arranged.

This species is readily distinguished from *P. angulatum*, with which it is associated, by its being coiled nearly on a plane, instead of having the spire directed towards the upper side, its laterally compressed form, and by having the angulate portion sharply defined, and projecting further beyond the aperture.

PLATYCERAS PROCLIVE (N. Sp.). Pl. 2, fig. 2.

Shell dome-shaped, patelliform and low. Apex obtuse, subanterior, inclined posteriorly and a little to one side, and but slightly elevated above the surface. Aperture oval, twice as wide in its longest diameter as the height of the shell. Surface marked by regular concentric striæ, that are crossed by well defined

wavy ridges, which continue directly across the shell from the posterior half, where they are most distinct, to the anterior half; as they go directly across the dome, they have an arched appearance, if viewed from the side; they are the most prominent on the left side.

The appressed, not spiral apex, and fine transverse arched, instead of radiate, plications are the most distinguishing characteristics which separate this species from the other campanulate forms.

PLATYCERAS MEMBRANACEUM (N. Sp.). Pl. 2, fig. 3.

Shell very thin, long, conical, rapidly tapering near the upper part to a sub-lateral apex. Aperture with a few, small, dentate projections, placed far apart, and would be somewhat oval if the specimen were uncompressed. Apex unknown, but judging from the contour it was sub-acute. Surface not plicate, with a few, faint traces of concentric striæ.

This species resembles *P. plicatum*, Hall, in form; but differs in the exceedingly thin shell being without plications or cancellations.

The necessity for a revision of the genus *Platyceras* will forcibly present itself upon the grouping of such distinct and widely divergent forms as the three here described, and is more evident than when examining the forms from a group rich in species, e. g., those from the Delthyris Shaly Limestone; figured in the *Paleontology of N. Y., Vol.* 3, where they can readily be graded from one to the other. A further division, however, at least into sub-genera, would be very convenient, and avoid confusion.

PENTAMERELLA COMPRESSA (N. Sp.). Pl. 2, fig. 4.

Shell ventricose, laterally compressed, length one-third greater than width; strongly plicate, with a prominent mesial fold.

Ventral valve with beak acute, incurved, and projecting over that of the dorsal valve; area on the sides of the fissure well defined and high, continuing to the apex. Foramen elongate, narrow, mesial sinus deep, and projecting much beyond the others.

Dorsal valve sub-quadrate, beak acute, sides rising abruptly to the prominent mesial fold at an acute angle, giving it a triangulate aspect when viewed from the beak on a plane with the valve; beak straight on a plane with the valve. Surface marked by prominent plications, of which there are three on either side of the mesial fold; these are crossed by concentric lamellæ which are well recurved, with projecting margins on the plications, and are marked by fine, closely arranged, radiating striæ.

SPIRIFERA ASPERATA (N. Sp.). Pl. 2, fig. 5.

Shell gibbous, sub-rhombic ; cardinal extremities rounded, umbones incurved, mesial fold wide, plications strong, hinge line shorter than the width of the shell.

Ventral valve prominently rostrate, area high ; placed on the same plane with the valve ; foramen narrow ; beak curved well over area. Dorsal valve sub-triangular in outline, beak abruptly incurved and terminating at the hinge line.

Surface with from four to five plications on either side of the mesial folds, which is well defined. Radiating striæ fine, thread-like, sharply elevated, and are placed at nearly equal distances apart, somewhat more than their diameter ; increase by interstriation, and are asperate at regular intervals, the points being as far apart as the distance between the striations.

From the upper part of the shale.

This species is distinguished from *S. eudora* by the area of the ventral valve being placed on a plane with the valve, and not directed outwards, the narrow foramen and the beaks being more strongly incurved.

CRANIA DENTATA (N. Sp.). Pl. 2, fig. 6.

Shell small, oval, apex pronounced, moderately acute, nearly central, smooth; elevation to length as one to four; slope slightly concave, with a small convexity near the posterior margin.

Surface smooth in the apical third; gradually becoming ribbed towards the margin, where there are about thirty, which

extend beyond the margin in dentate projections; the smaller generally commencing between the others about half way from the apex. Ventral valve unknown. Length one-eighth of an inch; width but slightly less.

But one specimen has been found, which adheres to the ventral valve of a *Meristina nitida.*

CRANIA GRACILIS (N. Sp.). Pl. 2, fig. 7.

Shell very much appressed; fragile, irregular in outline, with a tendency to unequal lateral expansion; incurved on the posterior margin. Apex acute, rising rather abruptly from the surface of the shell, inclined a trifle posteriorly, position irregular, nearest the incurved margin.

Surface quite smooth, with very fine, concentric striæ, which are irregular in disposition as though the animal had built on a part of the lip only at a time. Slope concave. Length of the specimen from the posterior curve to the anterior margin three-sixteenths of an inch. Breadth one-fourth of an inch. Ventral valve unknown. Attached to the inside of the outer chamber of an *Orthoceras virgatum.*

This species can readily be distinguished from *C. siluriana*, Hall, by its extreme tenuity and flatness.

CRANIA PANNOSA (N. Sp.). Pl. 2, fig. 8.

Shell irregular in outline, spreading, appressed, slope concave. Apex a small sub-acute, posteriorly situated, node, with a smooth surface; which is but slightly eccentric in young shells.

Surface covered by a rough epidermis with loose, very ragged laminæ that grow wider as they near the lip. Young shells have a quite regularly concentric growth till they reach the diameter of about one-eighth of an inch; when nearly all lateral growth ceases at the posterior margin and continues by lateral and anterior expansion. Diameter of the largest about one-fourth of an inch each way.

Three individuals were found on the exterior of the *Orthoceras* in which the *C. gracilis* was attached.

AVICULA UNDOSA (N. Sp.). Pl. 2, fig. 9.

Shell almost flat, oblique, very thin; anterior alation rather small, terminating in an acute point; posterior alation broad, curved backwards along the hinge line into an acute point; body of shell long. Surface, except alations, marked by well defined, rather broad, flat, radiate plications, inter-plicate spaces shallow and about as wide as the plication; plications grow broader as they approach the margin and increase by inter-plication and bifurcation. Entire surface crossed by laminate striæ which are undulose where they cross the plications.

This species usually measures over two inches in its longest diameter; the smallest specimen in my collection measuring one and three-fourths, and the largest two and one-half inches.

CONULARIA MULTIPUNCTA (N. Sp.). Pl. 2, fig. 10.

Shell exceedingly thin, epidermic in character; very fragile, angles apparently quite sharp. Surface having a narrow, flat, barely elevated plication passing down the center of each side, tapering slightly towards the apex. Transverse ridges very fine, and have a rounding, downward curve from the sharp, linear sulcations at the angles; there are about twenty-five to one-eighth of an inch.

Only the interior of the shell is known, but judging from the microscopic, crowded punctures the ridges must be ornamented by a multitude of closely crowded nodes or points, of which there are thirty to one-eighth of an inch. Surface between the transverse ridges apparently quite smooth.

CONULARIA BIFURCA (N. Sp.). Pl. 2, fig. 11.

Shell gradually tapering, small. Surface crossed by very fine, smooth, thread-like, transverse ridges; many of which bifurcate once, and sometimes twice, in crossing from the sulcation of one angle to the other; they are bent abruptly downwards near the angles, and meet at an acute angle in the sulcations; and also have a faint downward curve towards the center of the sides; there are twenty to one-eighth of an inch.

Surface between ridges smooth.

CONULARIA TRANSVERSA (N. Sp.) Pl. 2, fig. 12.

Shell elongate, angles acute. Aperture with an angulate sinus at each corner, with a corresponding angulate projection from the center of each side. Surface crossed by nearly straight transverse ridges, which are directed somewhat downwards from the corners, meeting at an obtuse angle in the center of each side; they are placed about twice their width apart, and are ornamented by small, circular nodes with interspaces of about their own diameter. Surface between the ridges cross-lined by sharp plications, which cross from one node to the other at right angles to the ridges. Transverse ridges ten to one-eighth of an inch; plications and nodes fifteen to one-eighth of an inch.

Sulcations narrow, deep and sharply defined, with the transverse ridges ending abruptly at their margins.

CERAMOPORA ORBICUTATA (N. Sp.). Pl. 2, fig. 13.

Habit parasitic; small, flat, discoid, central portion slightly elevated, from which point the lip of a lamination extends outwards and curving backwards to the outer border of the disk, showing that it increased by growing upon itself in a spiral laminæ, and gives no evidence of any further lateral extension. Cells closely arranged, directed outward from the center at an oblique angle tending in the direction of the spiral growth; and have a prominent, nariform calice over the upper side. Outer border of disk striate.

From the upper part of the shale.

RHINOPORA CURVATA (N. Sp.). Pl. 2, fig. 14.

Corallum very thin; foliate. Cells round or roundish oval, placed near the upper side of the thin pustulate calices that rise gradually from the surface at their lower side, and somewhat more abruptly at the upper side, thereby giving an upward direction to the cells. The cells are arranged closely in regular rows that cross each other diagonally; thus making a quincunx disposition of them; the regularity of the rows is

sometimes disturbed by the bifurcation of a row as the frond increases in size.

Curve amounting to the width of three rows in one-half inch. Cells seven to one-eighth of an inch in the rows.

This coral bears some resemblance to *R. verrucosa* of the Clinton group; which differs, however, in the cells being much more prominent, the pustulose character being more defined, rising abruptly from the surface, in having the cell-opening centrally located, and by its small cells.

STOMATOPORA RECTA (N. Sp.). Pl. 2, fig. 15.

Parasitic, adnate, Cells uni-serial; with lateral series branching off at irregular intervals, sub-cylindrical, elongate, slightly expanded at upper end, abruptly contracted laterally; opening in a thin cylindrical calice which projects upwards and slightly forwards; and when it is perfect its diameter and height are half of the dimensions of the cell from which it rises.

Cells eight to one-fourth of an inch.

Habit parasitic on shells, corals and crinoidal columns.

From the upper part of the shale.

Distinguished from *S. inflata* by the cells being more elongate and not so inflated in the upper portion, and the prominent calice.

STOMATOPORA PARVA (N. Sp.). Pl. 2, fig. 16.

Adnate, minute, irregularly branching. Cells uni-serial, sub-cylindrical, not inflated, somewhat variable in length, some being a third shorter than the average. Calice slightly elevated.

This species is about one-third as large as *A. recta*, and is readily recognized by its minute size and straight cells.

CHAETETES EXPANSUS (N. Sp.). Pl. 2, fig. 17.

Corallum spreading in an irregular lamina. Cells sharply angulate, of various shapes from quadrangular to hexagonal; partitions thin; margins of partitions smooth, or slightly crenate; dentate at their juncture.

The oblique, rhomboid cell is seen wherever a regular growth took place.

Length of cell from one-sixteenth to three-sixteenths of an inch; about ten cells to one-eighth of an inch.

From the upper part of the shale.

TUBERCULOPORA (N. Gen.)

Corallum composed of a solid surface, covered with large, irregularly rounded tubercles, upon the surface of which are one or more circular, isolated cells, where they open abruptly.

Tubercles, where large, increase in size above the surface from which they rise, and are apparently simple, unicellular in their origin; but afterwards increasing by lateral budding or coalescing. Cells increasing in size from below up as the tubercle increases.

TUBERCULOPORA INFLATA (N. Sp.). Pl. 2, fig. 18.

Corallum ramose, central,or stem portion, solid, and comprises one-half of the whole diameter of the frond; it has a small, round axial opening about the size of one of the larger cells; upon this are placed large, irregular, rounded, inflated looking tubercles or papillæ, of the same solid character as the axial portion; and as they seem to be of unicellular origin, the irregularity in prominence, size and shape is due to the coalescence of two or more as they increase in size and meet by lateral expansion and also by lateral budding of the tubercle, as is shown by the comparatively small cells existing in the smaller nodes placed on the sides of the larger tubercles. Cells circular, of various sizes, each commencing as a mere point on the axial surface, or the lateral surface of a larger tubercle; and widens out as the tubercle forms around it, and are lined by a well defined envelope; sections of which exhibit a distinct fibrous structure which radiates from the cell at right angles; differing markedly from the surrounding coralline structure which radiates from the center towards the periphery and does not show any decided fibrous structure.

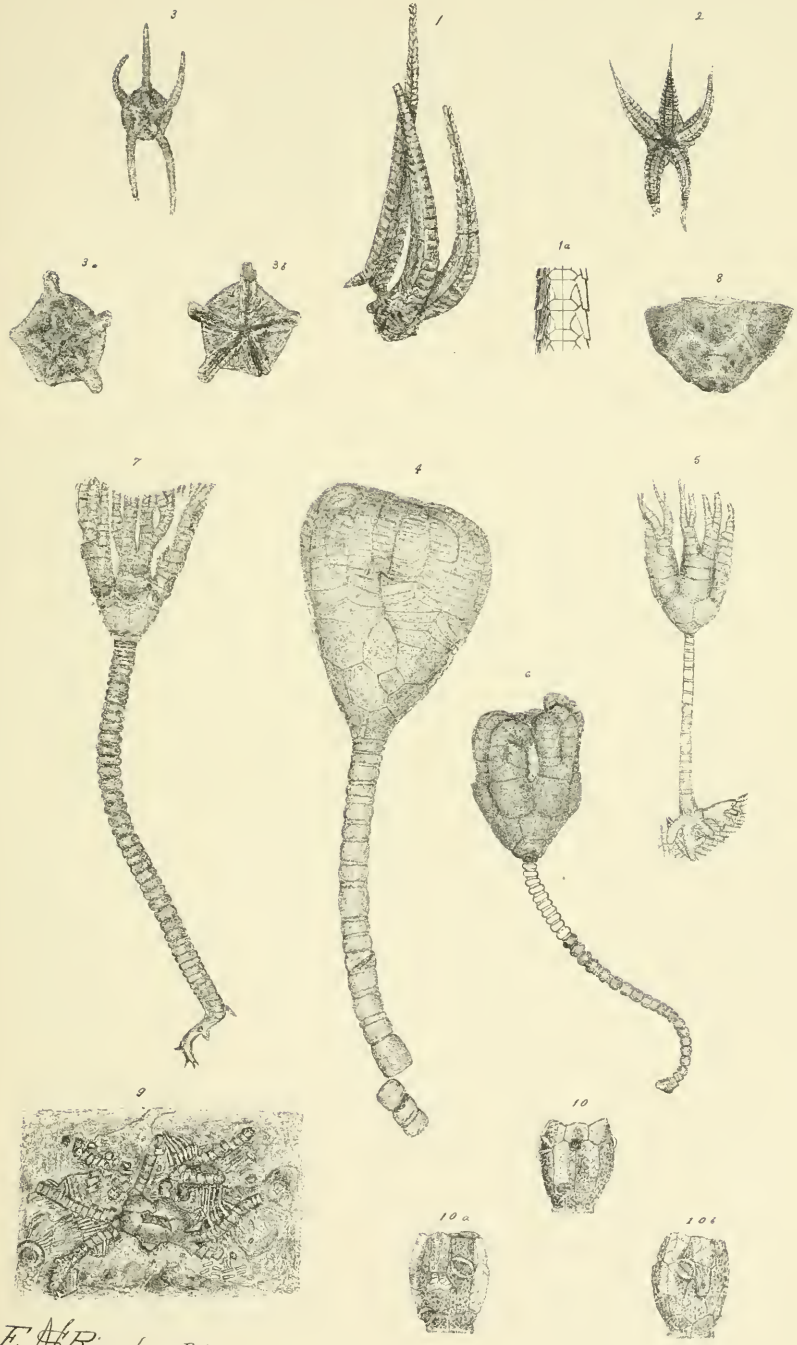
The species described were all collected at Lockport, New York, and are from the lower part of the shale, except where otherwise stated.

The types are in my collection.

Pl. 1.

1. *Squamaster echinatus.*
   a, diagram to illustrate the arrangement of the plates, denuded of the spines on one side.
2. *Protaster stellifer.*
   a & *b*, dorsal and ventral sides of another specimen.
3. *Eugaster concinnus.*
4. *Lecanocrinus solidus.*
5. *Lecanocrinus nitidus.*
6. *Lecanocrinus incisus.*
7. *Lecanocrinus excavatus.*
8. *Lecanocrinus putcolus.*
9. *Platycrinus corporiculus.*
10. *Callocystites tripectinatus*, ventral side.
    a, sinistral side.
    b, dextral side.

PLATE I.

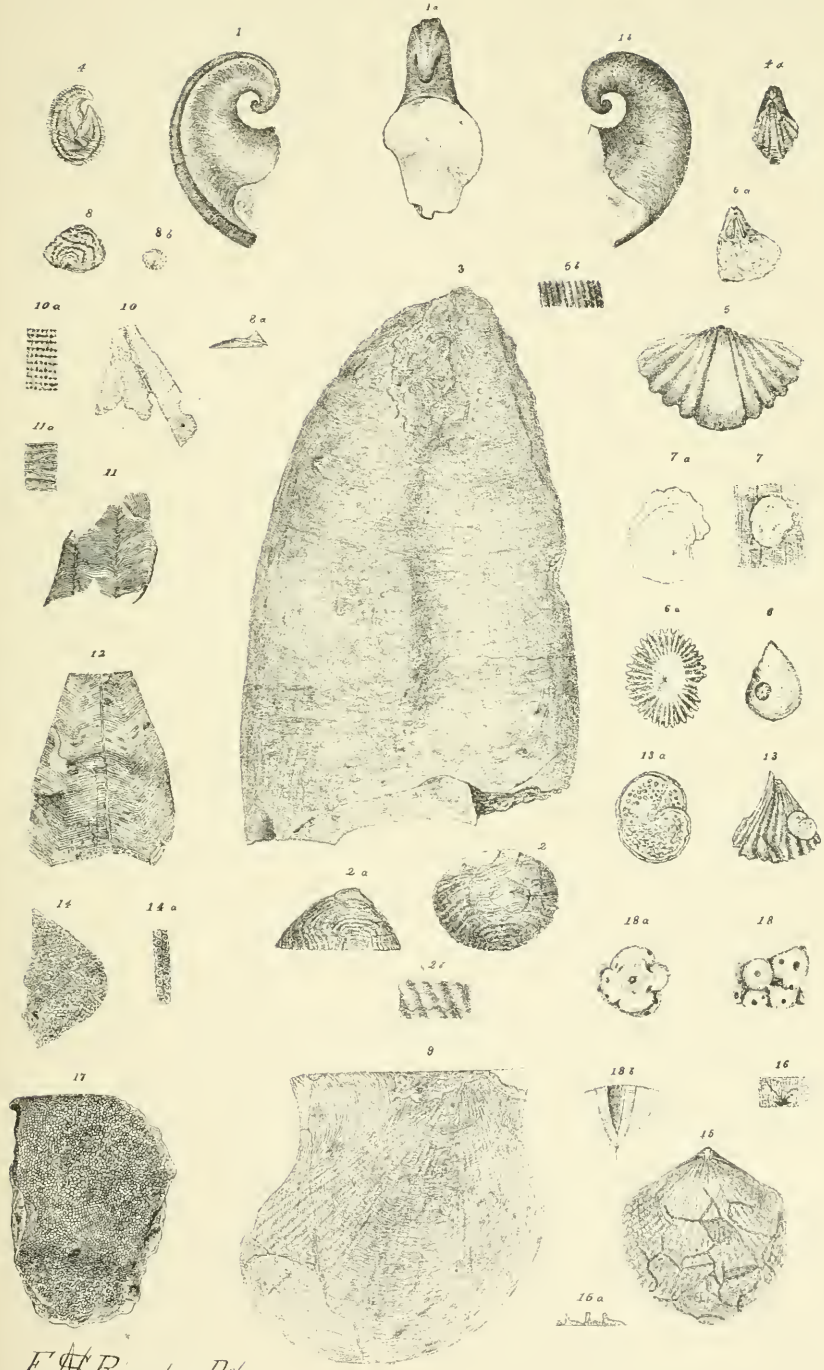


E. A. Ringueberg. Del.

Pl. 2.

1. *Platyceras laciniosum*
   a & *b*.
2. *Platyceras proclive.*
   a, lateral view.
   b, portion of the striæ enlarged; three diam.
3. *Platyceras membranaceum.*
4. *Pentamerella compressa.*
   a, dorsal side.
5. *Spirifer asperata*, dorsal valve.
   a, inner side of a portion of a ventral valve showing the narrow foramen.
   b, portion of *a*; enlarged five diam.
6. *Crania dentata.*
   a, dorsal valve enlarged four diam.
7. *Crania gracilis.*
   a, dorsal valve enlarged two diam.
8. *Crania pannosa.*
   a, profile.
   b, young individual.
9. *Avicula undosa.*
10. *Conularia multipuncta.*
    a, portion of the surface enlarged ten diam.
11. *Conularia bifurca.*
    a, surface enlarged four diam.
12. *Conularia transversa.*
13. *Ceramopora orbiculata.*
    a, enlarged three diam.
14. *Rhinopora curvata.*
    a, two rows enlarged three diam.
15. *Stomatopora recta.*
    a, profile of three cells enlarged three diam.
16. *Stomatopora parva.*
17. *Chætetes expansus.*
18. *Tuberculopora inflata.*
    a, end of branch.
    b, enlarged section of cell showing the fibrous envelope.

PLATE II.



E. A. Ringueberg Del

II. FOSSILS FROM THE WATERLIME GROUP NEAR BUFFALO, N. Y.

BY JULIUS POHLMAN, M. D.

The Waterlime group near the city of Buffalo continues to yield specimens of fossils in various states of perfection. The numbers are few, but as the fauna of the group is very limited, each additional fragment found aids us in a more correct understanding of the interesting crustaceans which seem to have been the only representatives of animal life at that period of the geological history of our continent. Fragments of Pterygotus have been found at long intervals here, as well as in England, but none have been in a satisfactory state of perfection, and it is therefore with pleasure that I record the finding of the first specimen complete enough to clearly illustrate the different parts and their proportions.

The specimen under consideration presents the dorsal side of the carapace and eleven body segments. At first sight we must admit that it bears a very close resemblance to Eurypterus, and it may be a difficult matter to distinguish between fragments of the bodies of the two genera if the surface markings, which are apparently characteristic of Pterygotus, have been obliterated.

Viewed as a whole, the most striking difference between Pterygotus and Eurypterus, is the comparatively small carapace of the former. In the latter the average length is equal to the length of four or five of the anterior body segments, but in Pterygotus it is a little shorter than the length of the first three segments. The feet are in every respect considerably smaller in Pterygotus than the corresponding organs of Eurypterus. The whole body of the specimen is covered with small scales, which assume a pustulose character on the two posterior segments.

As the special characteristics of the Pterygoti are unknown, and not desiring to multiply species, I refer the specimen to *P. Buffaloensis*, Pohlm. (B. B. S. N. S., Vol. iv, p. 17), because its corresponding parts seem to be identical with it.

PTERYGOTUS BUFFALOENSIS. Pohlm.

The carapace is smooth and semi-elliptical, with a proportion between length and width of about seven to ten. The eyes are marginal, project beyond the outline of the carapace, and have the appearance of the eyes of insects. A small tubercle situated centrally is visible, but not very distinct. The carapace is three and three-quarters inches wide and two and five-eighth inches long.

The body segments are somewhat imbricating and all of the same length, about one and one-half inches in this specimen. As in the Eurypteri, the segments increase in length posteriorly; this is a good mark of distinction between the two. The thoracic portion of the body is almost as wide again as the base of the carapace, and measures in the maximum seven and one-half inches. From here the body gradually narrows toward the head and toward the tail, where the eleventh segment has a width of two and one-half inches. The anterior and posterior lateral angles of the five anterior segments are rounded; those of the remaining segments are more pointed.

The specimen has been subjected to a heavy lateral pressure, which has caused a displacement of the appendages and a compression of one side of the thoracic portion of the body, which gives to the dorsal side the appearance of being much narrower than it really is; but the exact dimensions were obtained, when after careful manipulation the anterior half of the fossil was removed from the stone, and a fine exposure of the ventral side of the animal became visible. (Fig. 1, Plate 3.) The compression has affected only the one lateral half, and left the other side in its natural state. In addition to this four anterior feet and one swimming foot were exposed.

The views expressed by Prof. Hall, Palæontology of New York, Vol. iii, p. 401, that the number of the body segments of

Pterygotus would be found to correspond with those of Eurypterus, notwithstanding the figures of Profs. Huxley and Salter, are corroborated by this specimen. The dorsal side shows the first and second segments clearly separated, but the ventral side has them soldered together so firmly that not the faintest trace of an articulation is visible, and the specimen with eleven ventral segments has twelve on the dorsal surface.

This first (and second) thoracic segment of the ventral side contains in the longitudinal median line of its anterior half a small, irregularly rhomboidal shaped plate of about one-half inch in width, which has its most acute angle pointing anteriorly along the median line, where it connects by a small suture with the anterior margin of the segment, which at this point forms a small indentation. The posterior part of this little rhomboidal plate contracts suddenly with a curve at about the middle of the segment; the two sides do not connect, however, but elongate from here into a narrow strip of about 1-16 inch, and gradually part again to 3-16 inch, when the posterior margin of the double segment is reached, where they unite with a light curve. Underlying this long, narrow portion of the appendage is another part bounded by suture lines, which begin at the lateral angles of the small rhomboidal plate and extend down in a slightly curved line to the point where the appendage connects with the posterior margin of the segment. There are no terminal processes with the exception of a small triangular extension which extends beyond the segment posteriorly. The posterior part of the appendage has a smooth surface; the rhomboidal plate is scaly like the whole segment.

The second (or third) ventral segment is also composed of two parts which overlap each other in the middle.

The scale-like markings on the ventral side are more abundant and coarser than on the dorsal side.

The anterior feet are not as perfect as could be desired, but there is enough to aid us in our determination. All the feet are very much thinner than the corresponding organs in Eurypterus, although otherwise similar and in having eight joints.

Of the first anterior foot, this specimen shows only two joints rather indistinctly ; the second is represented by six joints ; the third by seven ; the fourth is complete, and exhibits eight joints and a terminal spine like Eurypterus. The first three feet are alike in structure and strength ; four short basal joints, of which the second, the longest, is only about twice as long as its width, measure together one inch in length. The fifth and sixth joints of the second foot are each one inch long ; the fifth is 3-32, and the sixth 1-16 inch broad. The first six joints of the third foot are like those of the second foot ; its seventh joint has a length of 7-8 inch and a width of a little less than 1-16 inch. The fourth foot is more strongly developed than the other three ; its basal joint is strong and almost oblong, about 5-8 inch long and 7-16 inch wide; it carries on its interior margin several long, strong teeth. The second joint is a little shorter than the first and tapers a little exteriorly ; the third is very short, only half as long as wide ; the fourth is as long as the second, but only half as wide and tapers toward the outer end ; the fifth joint is a trifle longer, increases again at its exterior end to the width of the interior margin of the fourth ; its length is a little more than 3-4 inch ; the sixth joint is almost twice as long as the fifth, 1 3-8 inches, and throughout half as wide as the exterior margin of the fifth ; the seventh joint is only 3-4 inch long and but little more than half as wide as the sixth ; the eighth joint is about two-thirds as long as the seventh and correspondingly narrower. The terminal spine is triangular and about one-third as long as the eighth joint ; it has for its base the whole width of this joint, and tapers gradually to a sharp point. The total length of the fourth foot is 5 3-8 inches.

The swimming foot has been displaced, but shows eight joints very clearly. (B. B. S. N. S., Vol. iv., p. 17.) Its basal margin is armed with strong teeth, which decrease in size posteriorly ; the rhomboidal plate is, like the whole appendage, comparatively smaller than that of Eurypterus ; the second and third joints are short and strong ; the fourth and fifth are almost twice as long as the preceding ones and articulate to each other by strong

processes ; the sixth joint is articulated to the fifth in the same manner, and surpasses it a little in length ; the seventh joint dilates somewhat, is as long as the five preceding joints together, and has on its exterior margin a triangular indentation with the apex a little anteriorly ; this is formed by the prolongation of the joint anteriorly, and by a triangular piece attached by a soldered suture line posteriorly ; into this indentation the ovate shaped palette is articulated. No terminal palette is present.

The surface of the first joint is covered with scales, and assumes a pustulose character on the second and third joints. Length of the whole swimming foot is 6 1-4 inches.

A fragment of a chelate antenna is exposed on the ventral side, and although it demonstrates clearly that it really was the largest of all the appendages of the genus Pterygotus (B. B. S. N. S., Vol. iv., p. 17,) we are as yet in the dark about its place of attachment to the body.

Length of whole specimen 15 inches ; greatest width 7 1-2 inches.

Found in the Waterlime group near Buffalo, N. Y.

PTERYGOTUS BILOBUS, Huxley and Salter.

A fragment consisting of eight posterior segments, and the tail has been found, which presents no special characteristics of the body excepting the equal length of the segments. The interest lies in the caudal appendage. Although the tail of this specimen differs in its proportions as well as in size from that of the above named species, as figured in the Palæontology of New York, Vol. iii., p. 424*, it can well be referred to it for the present. This tail is ovoid, and has a length of 1 3-4 inches and a width of 3 1-4 inches. It is divided in the middle of its posterior margin by a deep indentation of about 1-2 inch. A line which divides the tail into two lobes for two-thirds of its length can be seen from this indentation running anteriorly.

Length of the whole specimen 13 inches. There are no surface markings ; the segments are too fragmentary for a detailed description, but they show that the animal must have been com-

paratively broad, for the posterior segment has a length of 1 1-2 inches by a width of 3 inches.

Found in the Waterlime group near Buffalo, N. Y.

CERATIOCARIS ACUMINATUS, Hall.

This was apparently the rarest genus of all the fauna of the Waterlime group. Besides the few fragments described in the Palæontology of New York, Vol. iii., p. 420*–423*, and in this Bulletin, Vol. iv., p. 19, no discovery of this remarkable crustacean has been recorded in America. The present specimen (Fig. 2, Plate 3) is perfect, and presents in a lateral view a close resemblance to the figures of the specimens found in England.

The carapace of this species is described by Prof. Hall as follows: "Carapace somewhat rhomboid-ovate; width a little less than one-half the length; posterior articulating margin less than half the greatest width in the middle. From the postero-basal margin the outline is gently curved downward for about three-sevenths of the length, and then turns more abruptly upwards and forwards, the anterior end terminating in an acuminate process. The lateral margin is marked by a narrow raised border. Dorsal margin slightly curved for three-fourths of the length, the anterior fourth being more abruptly bent downward to the pointed extremity. Surface strongly striated concentrically."

The median line which divides the carapace into two halves, can be seen in this specimen from the posterior margin of the carapace to within 1-2 inch of the anterior acuminate process. There are no ocular spots visible.

The body shows five segments and the caudal appendage. The first and second of these articulations are slightly imbricating and of almost equal size, 3-8 inch long and one inch wide, with slighuly rounded angles. The third articulation is twice as long, tapering slightly posteriorly; the fourth is 5-8 inch long and 7-8 inch wide at its anterior, and 3-4 inch wide at its posterior margin. The fifth articulation is the longest; it is about oblong, 1 1-4 inches long and 5-8 inch wide. The first and second articulations show a surface-marking of delicate obliquely running striæ. The other articulations are apparently smooth.

The ventral margins of the two posterior segments are sharply defined, but those of the anterior three are blurred and indistinct, and have the appearance of a possible attachment of appendages. Part of one foot is visible, resembling closely the swimming feet of the Eurypteri ; it is partially covered by the carapace, and consists of a large ovate shaped joint, whose equal margins terminate exteriorly in an indentation, which holds a small terminal palette similar to that of the Eurypteri.

The caudal appendage consists of three spines, a large one in the middle and a smaller one on each side. The largest is two inches long and about 3-8 inch wide at its base, tapering from here into a sharp point. It seems that this large spine was triangular in shape and grooved or hollowed on its ventral side for the reception of the two smaller ones, which appear as if they had been hinged to the posterior margin of the fifth segment underneath and on each side of the large spine by a small rounded articulation.

The two smaller spines are 1 3-8 inches long ; they are widest, 3-16 inch, at about one-third from their anterior end. From this widest part they taper to a sharp point posteriorly, and curve down to a blunt rounded margin anteriorly, which portion is partially covered by the large spine. The posterior part of the latter is delicately striated longitudinally. The two smaller spines are without markings.

Length of the whole specimen 8 1-2 inches, length of carapace 3 1-2 inches, greatest width of carapace, 1 7-8 inches.

Found in the Waterlime group near Buffalo, N. Y , and presented to the museum by Mr. Herbert U. Williams of this city.

EUSARCUS, Grote and Pitt.

This genus was established, (B. B. S. N. S., Vol. iii., pp. 1–2,) upon a specimen without tail and a partially broken carapace. Since that time I have found several specimens, more or less complete, which show that a new genus is not admissible here, and that it must be classed with the Eurypteri, because the leading characteristics of the genus, as given by Dekay, are present, "a terminal joint prolonged into a sublinear or lanceolate triang-

ular spine with serrated edges," and "eyes reniform or oval, placed within the margin of the carapace."

The species is well named, as the whole shape bears a striking resemblance to that of a scorpion. Hereafter *Eusarcus scorpionis* should be known as

EURYPTERUS SCORPIONIS, Grote and Pitt.

Carapace almost straight in front; broadly rounded at the lateral anterior angles; sides slightly curved for about two-thirds of the length of the carapace, at which part it attains its greatest width. The remaining posterior third of the lateral margin in a slight curve decreases the posterior width of the carapace a trifle; the posterior margin has a slight curve inwardly in its middle third, and forms almost right angles with the lateral margin. The length and width of the carapace are in proportion as five to seven. The eyes are not very well defined in my specimens, but seem to be semi-oval; they are larger than in any other species of Eurypterus, and are placed near the margin of the carapace in the broadly rounded anterior lateral angles. The distance from the margin is less than the width of the eyes themselves. (Fig. 3, Plate 3.) There are no surface markings on the carapace.

The first seven segments of the body form a large ellipse, of which the fourth is widest, and the seventh contracts very remarkably, so that the eighth is only about one-fifth as wide as the fourth. The ninth, tenth, eleventh and twelfth segments are only a trifle narrower than the eighth, but increase in length posteriorly, so that the twelfth is nearly twice as long as wide. Indeed, the four posterior segments are as long as the eight others together. The surface of the specimen is very distinctly marked with small triangular pustules, distributed very irregularly.

The tail spine has a slight curve, which is a distinct characteristic of the species, as all other Eurypteri have a straight caudal appendage. It is about one-third longer than the posterior segment.

The feet in all the specimens are not complete enough to admit of any detailed description.

EUSARCUS GRANDIS, Grote and Pitt,

Was based upon a larger fragment of *Eurypterus scorpionis*. Now it happens that I have five fragmentary specimens of different sizes, ranging in length from 4 1-2 inches to about 32 inches, but here the difference ceases. All other characteristics are alike, and it plainly shows the fallacy of basing a new species on size only. All the different specimens simply show different stages of growth, and *Eusarcus grandis* has to be dropped entirely from the Waterlime fauna, because it represents merely a more nearly full-grown specimen of *Eusarcus* (*Eurypterus*) *scorpionis*.

All the specimens were obtained from the Waterlime group, near Buffalo.

In the same beds which yielded the above described Crustacea, I found a number of small plant remains, which were submitted to Prof. Lesquereux, Columbus, O., who kindly sends the following description:

ON FRAGMENTS OF A SPECIES OF MARINE PLANT FOUND IN THE WATERLIME GROUP NEAR BUFFALO.

The plant is represented by a large number of small fragments irregularly deposited upon slabs of limestone, as if they had been spread around by the waves. The fragments are black, their texture transformed into a carbonaceous substance, all flat or flattened by compression or maceration, with borders parallel, distinct and regular. They are evidently remains of marine Algæ and referable by their characters to the order of the *Florideæ* and to the genus *Chondrites* as established by Sternberg.

Chondrites St.—Fronds cartilaginous (in living plants), filiform, sometimes robust and subcaulescent, dichotomous in their primary divisions, with branches and branchlets sometimes subpinnate, cylindrical, generally compressed and flattened in the fossil state.

To this genus, which includes part of the old genera *Fucoides* and *Gigartinites* of Brongniart, are referred now all the fossil Algæ with frond cylindrical, generally filiform, many times dichotomous, rarely pinnatified or irregularly branching, with

smooth surface and without articulations. These characters are common to a large number of marine Algæ of the present epoch, especially to species of *Chondrus*. But the relation of fossil to living plants is based on a mere superficial likeness; for the living Algæ are now grouped and classified according to the characters of their organs of reproduction, rather than by the appearance, size and form of their fronds and branches, the only parts which remain observable in fossil plants of that kind.

Chondrites graminiformis. Sp. nov.—Fronds brittle, with few dichotomous branches in acute angle of divergence, all exactly linear by compression, more or less flexuous, generally broken in short fragments; surface covered with thin, smooth, coaly pellicle.

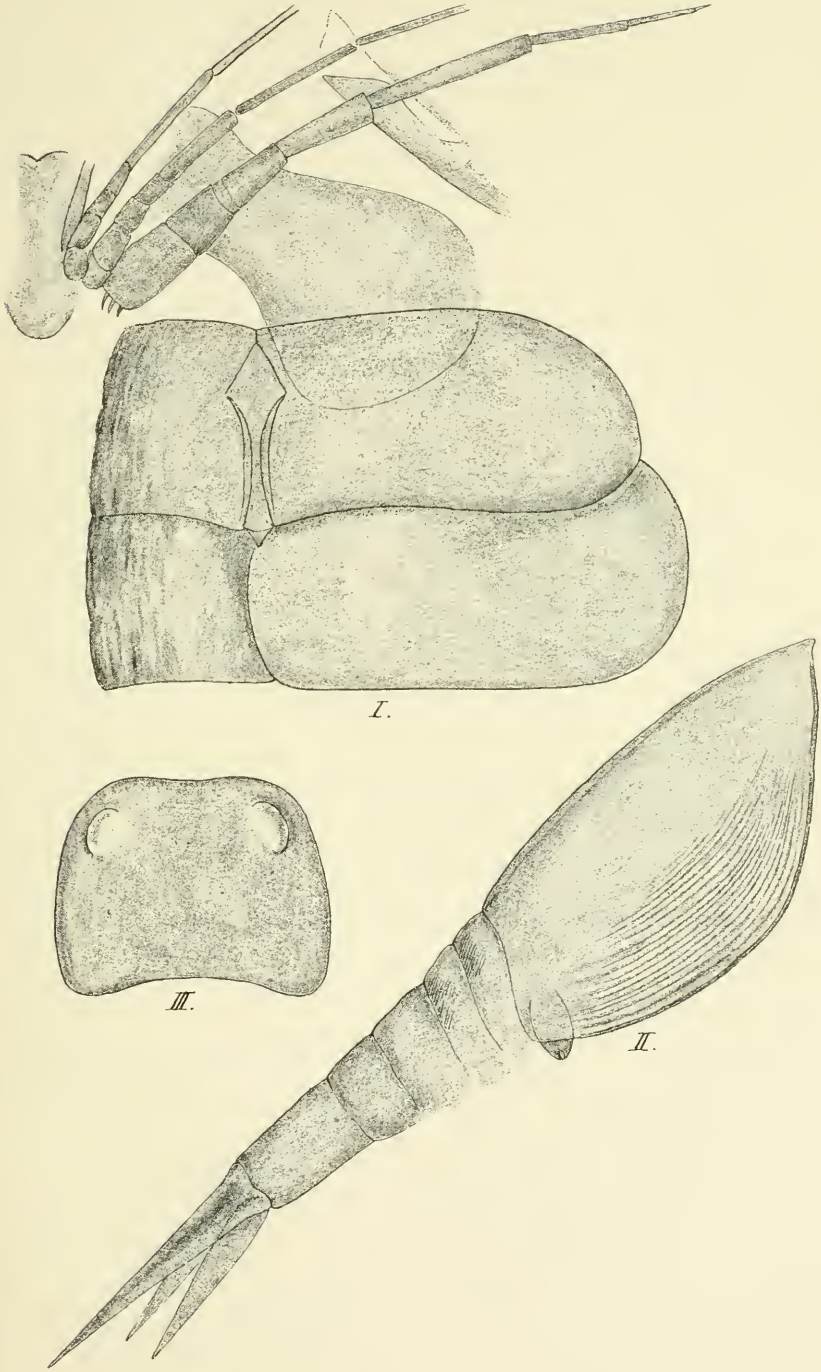
These fragments are numerous and very distinctly traced in black upon the grayish-white and colored slabs, 1 to 1½ mill. broad, mostly short, from ½ to 3 cm. long, the longest fragment preserved being a curved branch 5 cm. long. They are spread upon the stone in every direction and in such a way that the primary divisions of the frond cannot be recognized. For all the fragments are simple, or with only a branchlet diverging in a very acute angle near the top of a few of them.

The species has, by the form and mode of division of the branches, the character of *Chondrites setaceus*, Heer, a jurastic species of Switzerland (Oxfordian), from which it differs merely by the greater width of its branches, which are at least twice as broad. The general appearance, mode of ramification, and texture are the same.

The species, as it is, may be easily represented to the mind by the description and without figures. If, however, better specimens should ever be obtained, it would be worth while to have it figured carefully, especially to have a representation of the basilar part of the frond.

Fossil remains of true marine plants are of rare occurrence; for a large number of those which have been described as such represent tracks or burrows of worms or of other marine animals. These, however, are never covered by a carbonaceous layer.

PLATE III.



I.

III.

II.

P.

III. NIDIFICATION OF BIRDS ON THE ST. CLAIR FLATS.

REV. J. H. LANGILLE.

An idea of the extent of St. Clair Flats may be formed from the length of the several channels which radiate from the mouth of St. Clair River to the distance of some seven or eight miles. These are bordered with flooded marshes, which sustain a heavy growth of sedges, cat-tails, rushes, and coarse marsh-grass. Some of these marshes are dry in summer, and there are several islands with trees and arable land; the whole being cut up and intersected by numerous small channels. Here, in the marsh-grass, and for the most part over the water, is the breeding place of a considerable number of our water-fowls.

The most characteristic bird of the place in the breeding season is the coot, *Fulica americana;* the nests of which abound in nearly all parts of the flooded marshes, especially in those parts extending out into the lake. In every direction the birds may be seen swimming, wading and flying ; while their loud cooing and clattering noise is almost incessant night and day. These birds are quite shy about leaving the nest. Though the latter are generally open to view for some distance among the broken-down sedges and cat-tails, the birds manage to leave them before they are seen, running on the water with flapping of the wings for some distance, then either taking flight for a short distance, or swimming at ease. Often while diverting itself on the water, and always when rising, this species makes a loud splashing noise, reminding one of its Western common name, "the splatterer."

The nests on the flats are invariably floating, or raft-like structures, generally built over water from eight to eighteen inches deep. They are mostly built of the dried leaves of the cat-tails,

when completed being often lined with fine dried grasses or the finer leaves of sedges. They are about a foot in diameter, some eight or ten inches high, with a finely-formed depression in the center, and often have a sort of inclined plane for entering the nest on one side. The color of the eggs is such as to be almost indiscernible from that of the nest at a distance.

One of the next most common birds in nidification is the common, or Florida gallinule, *Gallinula galeata ;* the nests of which are almost precisely like those of its near relative, the coot, except that they contain more of fine material, consequently are more compactly built and better edged up. They are also placed farther in from the lake, and more in the seclusion of grassy marshes and thick rush-beds of the shallow channels. The eggs, from eight to fourteen, about the same in number as those of the coot, are perceptibly smaller, and more tinged with a warm brown in the ground color ; the marking being of more irregular, larger, and lighter, or reddish brown, spots, much of it resembling the color of iron rust. The gallinule is still shyer than the coot in leaving its nest, and its voice bears quite a resemblance to that of the guinea-fowl much of the time, to which it adds a peculiar note, something like a musical shake on a reed instrument.

The eggs of both the above species are laid late in May or early in June, and the young are black in the down ; the coots having a little light rust-colored down about the head. Both leave the nest as soon as they are hatched.

Perhaps the next most common water bird in these parts in the breeding season is the red-headed duck, *Fuligula ferina var. americana.* Along the deeper channels, flocks of males may be seen feeding and sporting at their leisure, interspersed with an occasional female, or a blue-bill. The "*squawk*" of this species is quite frequent, and characteristic; and the "*meow*" of the male is precisely like that of a vigorous full-grown cat. A graceful, stately bird it is as it rides upon the waters ; and as a diver after its food, it is surpassed by few of its kind. The female, which, like the rest of her kind, bears the duties of nidification alone,

generally rises from her nest while one is yet some distance off, but almost always advises one by her peculiar squawk as she leaves, and generally alights in the water in full sight.

The nest, tied to the tall sedges or cat-tails, is built on the water of coarse material, generally lined with the leaves of the sedges; and, like the nests of the water-fowl in general, is made more complete as incubation advances, often containing quite a little down and feathers as the hatching approaches. The eggs, generally eight or ten, but sometimes fourteen or fifteen, are large, quite elliptical, with strong, smooth shell susceptible of a fine polish, and of a uniform, rich brownish tinge. They are laid late in May or early in June, and the young are olive green, with the cheeks and under parts bright yellow.

Next to this species in numbers breeds the dusky duck, *Anas obscura*. It generally seeks out the dry grounds, a clump of bushes, the high hummocks, or the accumulation at the side of an old log lodged in the marsh, or even the hollow or decayed side of such log. The nest is of the finer material of the spot, mostly dried grasses, is sunk into the ground, well edged up, and in the advance of incubation, well filled with the dark-colored down peculiar to the bird. The eggs, from six to ten, are oblong-ovate, smooth, generally of a brownish or reddish, often of a greenish tinge. The young are very dark olive-green, lighter on the cheeks and under parts. Owing to the shallow water frequented by the species, the eggs are generally much soiled, and the bird does not leave the nest till nearly trodden on, then rising almost straight into the air.

Nearly equal in numbers are the nests of the mallard, *Anas boschas*. They are placed and constructed like those of the dusky duck, sometimes, however, over water or on a muskrat-house, and contain about the same number of eggs, which, however, are rather smaller and of a more delicate greenish tinge. The young are like those of the best marked of our domestic duck.

Both these last species breed early, commonly during May. The mallard especially is greatly attached to her nest, and will

make great demonstrations of distress when startled even from her eggs.

Not infrequent in this locality is the nest of the ruddy duck, *Erismatura rubida*, the birds being quite common about the channels. The nests are generally very slight, often scarcely more than a matting together of the tops of the marsh-grass over the water, with a few additional grasses woven in ; sometimes, however, the nest is well made of fine grasses, especially if incubation be advanced ; sometimes it is but a slight placing of debris in a decayed cavity of a floating log, the arrangement being so imperfect that the eggs may roll out. These eggs are peculiar enough for a duck. Larger than those of the larger ducks, nearly white and somewhat granulated, they might easily pass for the eggs of some of the smaller wild geese ; especially as the duck can scarcely ever be caught on the nest, but stealthily dives from it like a grebe, before the hunter can detect it. These eggs may be found as late as July. The males in the high colors and strong markings of the breeding season are pretty objects as they float leisurely about with their large tails straight up and fully expanded. The flight of this bird is generally low over the water, and its wings are nearly as broad as those of the coot.

The nest of the blue-winged teal is occasionally found on the Flats, and rarely that of the blue-bill or even that of the canvass-back or the shoveller.

Very common, indeed, in the more open parts of the flooded marshes are the queer nests of the dab-chick, *Podilymbus podiceps*. They consist of a rounded or cylindrical pile, half floating, half stationary, in about a foot or eighteen inches of water, about fifteen or eighteen inches in diameter, built of soaked rushes and debris in general, well slimed through with Algæ, extending dome-like about three or four inches above water, and having a slight depression to receive the eggs—a nasty, filthy thing indeed for a bird's nest. The eggs, some five to seven, are a little smaller than those of the gallinule, and slightly rough or granulated, greenish white, often finely waved with green when clean, but are soon wretchedly soiled from the nest, especially

as the bird covers them nearly up on leaving it, which she does so slyly as never to be seen. The young ones just hatched, little black creatures, striped narrowly and lengthwise with white, white underneath, and marked with reddish about the head, will scramble from the nest before they can be seen; and notwithstanding their distinct peeping, are found with difficulty among the sedges and rushes. Now if you will hide away, you may hear the mother call the little ones with a gentle clucking, and see them gather around her on the water, perhaps mounting on her back or hiding under her wings. She will even dive with them under her wings on an emergency.

A very conspicuous bird about the Flats, and one breeding in considerable numbers, is the black tern, *Hydrochelidon lariformis*. Arriving about the middle of May, its black body, with silvery wings and tail and white crissum, appears in constant flight. Its nest is a crude arrangement of bits of rushes, sedges or debris in general, on a floating board or slab, or on an accumulation of debris anchored among sedges and rushes; the whole affair being often thoroughly soaked through with water. The dark greenish drab eggs, two to three, heavily spotted and blotched with black or dark brown, conform so closely in general effect with the nest and surroundings that they are by no means readily detected. The bird has an almost constant note, softer and more musical than that of the common tern; but when the breeding places are approached—for like other birds of its kind, it breeds in community—it becomes very noisy, and may be a great nuisance when one is intent on observing other birds.

The common tern and Forster's tern spend the summer here in moderate numbers, laying their eggs on the muskrat-houses, in the absence of those sandy and rocky shores which are their usual accommodation. The eggs are almost indistinguishable, those of Forster's tern being, perhaps, a little the larger. The birds are fairly distinguishable by their voices, that of Forster's tern being hoarser and in a lower tone than that of the common tern. In color, too, they are in some respects the counterparts of each other; the tail of Forster's tern being light silvery

gray and the under parts white, while in the common tern the under parts are gray and the tail is white. In flight they are commonly seen together. June is the breeding month of the terns above mentioned.

From my tent on Dickenson's Island, last May, I first heard the note of the king rail, *Rallus elegans*, in that locality. All night it could be heard in some four different places in the near vicinity, and the note was scarcely ever silent through the day. It proved to be breeding very commonly around all the sedgy ponds, but was so exceedingly shy that only an occasional glimpse of it could be had. Once in a great while would this stately bird step out, for a few moments, into full view. The nest is hid away in a perfect thicket of coarse dried marsh-grass, still standing with its curled and drooping withered leaves of the previous year. About a foot in diameter and about eight or ten inches through, from the rim to the bottom, which rested on the water, and about three or four inches deep inside, it was well built of the dried leaves of the marsh-grass, the rim being well laid. The whole was tied to the coarse standing culms of dried grass, and was thickly and elegantly arched over with the dried and drooping leaves. The bird adhered closely to the nest, making it easy to identify the nine to eleven roundish-ovate eggs, so finely tinged with a warm reddish brown, and sparsely spotted with reddish brown and lilac. As a consequence of its close adherence to the nest, it not infrequently becomes a prey to the marsh hawk, which also breeds on these marshes.

The dainty little nest of the Carolina rail, *Porzana carolina*, so finely arched over and tied to the marsh-grass on or over the water, is rather common on the Flats. The bird is exceedingly wary, and can scarcely be seen about her nest, leaving you to identify her six to twelve light brown eggs, heavily but sparsely spotted with dark reddish brown and lilac. The young are jet-black, with a little tuft of reddish down under the chin.

The vocal performance of this species is a quaint, coaxing strain of several syllables, which are at once striking and pleasing.

A very common sound, coming in every direction from among the bleached tracts of sedges, standing from the previous year like large fields of ripened grain, is the boom of the bittern, heard throughout the morning and evening. Every now and then the bird is seen in its elegant flight, or standing like a stake among the rushes. Though well hidden away in the thick sedges its nest is frequently found ; consisting of a slight matting together of the green marsh-grass over the water, so frail that one can scarcely conceive how it can contain the eggs ; or flatly, but substantially built on the water among the sedges, not unlike that of the coot. Very reluctantly indeed does it leave its three to five clear drab-colored eggs, sometimes sitting so closely that it may almost be touched before leaving its treasures. The nearly callow young, with erect and branching tufts of yellow down, are odd-looking enough.

The least bittern and the Virginia rail no doubt breed sparingly on the Flats ; and the night heron, constantly seen there in summer, sometimes in large flocks, no doubt breeds in woods not far away.

The maniac call and the merry laugh of the loon are common sounds along the channels throughout the Flats ; and its nest is often found arranged on the tops of the muskrat-houses. The large greenish-drab eggs, with dark brown spots, are generally two in number.

On the higher marshes the bobolinks are most abundant and musical ; while throughout the sedges and marsh-grass the long-billed marsh-wrens and the red-winged blackbirds and the swamp sparrows abound, breeding in immense numbers. Their spring melodies, too, are very agreeable amidst the numerous and harsher notes of the water-fowl. On a tall tree on the Island and in full sight from the tent, was a nest of the white-headed eagle ; and the woods resounded with the songs of our most delightful birds of the forest.

IV. NONAGRIA SUBCARNEA, N. S.

D. S. KELLICOTT.

The larvæ of two species of Nonagriinæ occur abundantly as borers in *Typha latifolia* growing in the vicinity of Buffalo. One is that of *Sphida obliquata*, G. and R., the other that of a species which, I believe, has not been described. I have known and observed these larvæ for several years, but have not yet made out the differences in the earlier stages of growth with much certainty. The adult caterpillars, however, are distinguished with ease, either by their structure or by their habits, so I shall describe only the adult of the one which I have called *Nonagria subcarnea*, and compare it with that of *S. obliquata;* also with that of *N. typhæ* of Europe, one of which Mr. A. R. Grote has been kind enough to furnish me.

This larva attains a length of 55 mm.; it is cylindrical, slender, naked, smooth and somewhat shining. The color is rather light; the skin in some examples is decidedly carneous, in others smoky, particularly on the thoracic rings. The lines are almost obsolete; the piliferous spots are small and round; a weak chestnut hair arises from each. The anal and thoracic shields are slightly corneous, brown and shining. The thoracic rings are strongly folded transversely. The spiracles are narrowly elliptical, even slit-like, with the rings shining black. The hemispherical head is light in color, mottled with ocherous.

The differences between this larva and that of *N. typhæ* are ample for its ready separation. It is less stout than *typhæ;* the spiracles are more narrow and longer; the epicranial suture is much longer, the fork not extending so far up on the head; and the color of the head of *typhæ* appears to be quite uniformly brown, while this one is mottled.

It may be separated from the larva of *S. obliquata* by its light, often carneous hue, that species being darker or quite black; the

brown thoracic shield of *obliquata* is divided in the middle line by a sharply defined white line; the last pair of spiracles of *obliquata* are larger than the rest and placed subdorsally, while those corresponding in *subcarnea* are placed laterally. Other characters presenting differences are the following: The proplegs in *subcarnea* are longer than in *obliquata;* the hooklets of the former are arranged more nearly in a straight line, in the latter in the form of a horse-shoe, toes inward; the true legs of the former are colored like the skin; in the latter they are dark with bands at the joints. A microscopical study of the mouth organs discloses marked differences.

Late in July and early in August both larvæ are found together, often in the same plant; they are now of about the same age and size; their mode of life up to this time has been similar, but from this point they take very different routes. *Obliquata* continues its larval life in the Typha until autumn, when it leaves its plant and crawls into old wood, the earth, or under loose bark of trees, hibernating as a larva. In May it pupates in a light cocoon, giving the moth about the beginning of June. Not so *subcarnea;* in July and August the larvæ prepare pupa-cells near the surface of the plant, always leaving a thin layer of epidermis unbroken over its place of exit; it pupates with the head uppermost.

The pupæ vary in length from 30 mm. to 40 mm.; the color is light brown; the anal ring ends in a thin, emarginate, horizontal plate; there are a few weak anal hooklets; the dorsal median line of the thorax is occupied by a strong ridge; the clypeus is prolonged into a stout, blunt spine. Figure 1 represents the pupa in side view.

Fig. 1

The imago escapes, leaving the pupa-shell in its place; in order to get out of the cell to expand its wings, it has to break up the membraneous covering of the place of escape; this it does by its very stout, frontal spine.

The Moth ♀ expands 45 mm.; reddish-gray, recently hatched specimens are often decidedly flesh-colored; the head, thorax and palpi are usually darker or fawn; the abdomen, of the shade

of the wings or lighter. The discal spot on the primaries is black and distinct in most examples; there are two well defined black dots between the discal and the base of the wing; one in the place of the orbicular and the other marking the intersection of the basal line and subcostal vein; the subterminal line is indicated by dots in the veinules; there is a row of black marginal lunules; fringes usually lighter than the wings. The secondaries have the same hue as the primaries, the discal is blackish; in some specimens a faint mesial line appears, in others it is obsolete; marginal lunules as on the primaries; fringes concolorous or lighter than the wings. Beneath the discals on both wings are distinct; also the marginal lunules; on the primaries from the base to the discal dots there is a reddish wash; beyond this a smoky space. All the wings above are often dusted with black scales.

The ♂ expands 38 mm. The color is darker than that of the ♀; the markings are similar.

The palpi of both sexes are rather slender, horizontal, and extend to the tip of the clypeal spine; the slender terminal joint is clothed. The very stout clypeal spine (Fig. 3) is concealed by the long dense hairs of the front, which thus presents a cone of broad base and rounded apex.

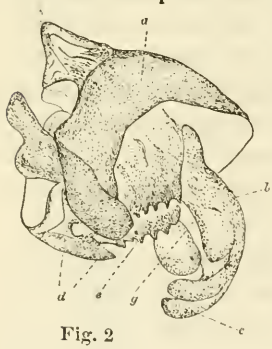


Fig. 2

The ovipositing apparatus of this moth appears worthy of special description and illustration. It is rather complicated as it is in those of its congeners known to me, but differs sufficiently to be of interest; moreover, the manner in which the eggs are placed is known, which lends additional interest to the structure which is made to accomplish so nice a piece of work. Figure 2 exhibits the strangely modified terminal rings of the ♀ abdomen. Of the three modified joints, the last is the short tubular ovipositor proper, usually concealed within the first of the three. The first piece (a) is chitinous, and supports the rest of the apparatus; the second piece articulates with the first at the upper side. On the lower face are two broad teeth (d) pointing back-

wards; between the teeth there begins a deep groove extending obliquely upwards to the anal opening; the chitinous borders (e) of this groove are dentate. The second ring is also chitinous; the basal part (b) is broad, concave below; the piece terminates in a narrower thin part, forked at the end with the rounded tips turned downwards; these two black lobes may be seen without removing the anal tufts; on the under side of the basal part there is a deep groove (g) beginning just above the anus.

By means of this apparatus the eggs are placed for the winter. They are arranged one after another, varying in number from a few to a hundred or more, in a tube formed by rolling over the margin of a withered dry leaf of the food plant. It appears that as the eggs are extruded and placed a little way back from the margin (about one-third the width), the same is then folded over the eggs and firmly cemented down, thus forming and filling the tube. The eggs thus covered with the leaf and cement appear to pass the winter under the snow, and more or less under water, unharmed.

I have not been so fortunate as to see the moth in the act of oviposition, although a number were kept for many days with Typha in an aquarium. I found, from time to time, many of the eggs, but visits paid by day or by night failed to discover the manner of the work.

The eggs are white, obscurely ribbed, short, cylindrical; the length equals .5 mm., and the width .875 mm. The shells are not very firm, so they are sometimes deformed by the pressure of the tightly drawn cover.

Since the larva of this moth bores the same plant as *N. typhæ* of Europe, it seems appropriate to compare the two species. The moths agree closely in size; *typhæ* is slightly larger (♂ 40 mm. ♀ 48 mm., Guenée); the ground color differs and the veins are not marked with white as in *typhæ;* the discal dots are not so plain on under side of hind wings, and much more distinct in fore wings; the secondaries are concolorous, while in *typhæ* they are lighter than the primaries, with the outer third darker; the first and second joints of the palpi of the latter are more heavily

clothed, and extend considerably beyond the clypeal spine. The differences in the spines appear in figures 3, 4, 5. There are other obvious differences.

A comparison with *N. cannæ*, which it approaches in character, exhibits plain differences. According to Herrick Schaeffer, *cannæ* has broad fore wings with acute apexes, the intraveinular marginal spots are wanting, and there are two spots marking the intersection of the inner line with the median and submedian veins; in *subcarnea* the primaries are not broader than in *typhæ*, and the apexes are not more acute, the marginal spots are present, and the inner line is not marked by two spots; again, the hind wings are concolorous, while in *cannæ* they are not.

Fig. 3

The differences between this moth and *N. sparganii* are not so obvious. They agree very well in size; the shape of the primaries are quite closely alike, also the intraveinular marginal spots as well as those upon the veins indicating the marginal line; in *sparganii* the secondaries are darker, scaled towards the outer half, the inner half being lighter than the primaries; there are spots at the origin of veins, three and four, surrounded by four black dots (H. S.); in *subcarnea* this character does not appear, while the hind wings are of uniform shade. *Subcarnea* is certainly very closely allied to *sparganii*. I have rarely found *Sparganum* bored by a larva apparently identical with the one from Typha; I have taken the same also in *Scirpus*.

Fig. 4

I introduce here figures showing the wide differences in the frontal prolongations of *subcarnea* (Fig. 3), *typhæ* (Fig. 4) and *N. subflava* (Fig. 5). These characters, it seems, afford good points for comparison and separation of species, for they prove to be quite constant, at least in the first. The spine of *subflava* is scarcely bilobed; it was not seen to be so until magnified by an inch objective.

Fig. 5

I have to acknowledge my obligations to Mr. J. A. Lintner for assistance and advice in the study of this moth.

V. HYDREOMENA TRAVERSATA, N. S.

D. S. KELLICOTT.

Head, thorax and abdomen dark gray above, with the third, fourth and fifth abdominal rings edged posteriorly with white. Base of the primaries blackish; basal line dentate, quite black, not oblique as in *trifasciata*, *Californiata* and others; beyond this there is a well-defined red band, more or less bordered with white; outside the red the wing is again black, becoming whitish before the median, black, slightly zigzag line, which is not oblique; between this and the extradiscal line the wing is white; this median band is as wide on the inner margin as on the costa; the latter line at first slightly wavy, reaching the first branch of the median vein, follows it half way from the intersection to the outer edge, then continuing to the inner margin, nearly parallel to the outer margin, forming two deep scollops between the branches of the median and two smaller ones between the latter and the inner vein; on the front of the wing, beyond the extradiscal, there is a black patch succeeded by a red one, which, following the line, becomes a mere band in the inner half of the wing; the submarginal space is whitish, with three well-defined black triangular spots on the subapical space, and the edge of the wing occupied by a black line. The posterior wings dull white, smoky towards the base, and the posterior edge lined with black; there is a single blackish band, much curved outwardly, on the branches of the median vein. The discal dots small, round, black, plainest on the fore wings above, and on the hind wings below. The fringes of both wings somewhat tawny and checkered by a darker shade at the veinules. Beneath, the secondaries have the same shade as above, with the single dark band more distinct; the primaries smoky throughout, except a large, pale, ash subapical spot corresponding with the red one above. The male expands 36 mm. Taken at Petoskey, Michigan, July, 1882.

The ornamentations of this moth appear to be sufficiently distinct to separate it from any other species or variety. In size it agrees with *Californiata;* the primaries have the outer edge less oblique, and the apex less produced. The discal dots are wholly different. It differs from all that approach it in ornamentation, in having the median white band as wide on the inner edge as on the costa, and having the basal and median lines not oblique—that is, they reach the inner edge as far from the base of the wing as on the costa. The specimens taken were fresh, and no shade of green was perceptible. The palpi are rather shorter than usual, pointed; the apexes approximated and turned downwards.

SYNGAMUS TRACHEALIS.

EXPLANATION OF FIGURES.

Fig. 1.—Adult male and female Syngamus, (enlarged 133 diameters). A, male; B, female, showing the head, œsophagus and intestine In the female may be seen the uterus and ovarian tubes filled with eggs.

Fig. 2.—Embryo of Syngamus removed from the earthworm and kept for 24 hours in an incubator, in the blood serum of a calf, at 105° Fahrenheit. About moulting the first time, (enlarged 200 diameters).

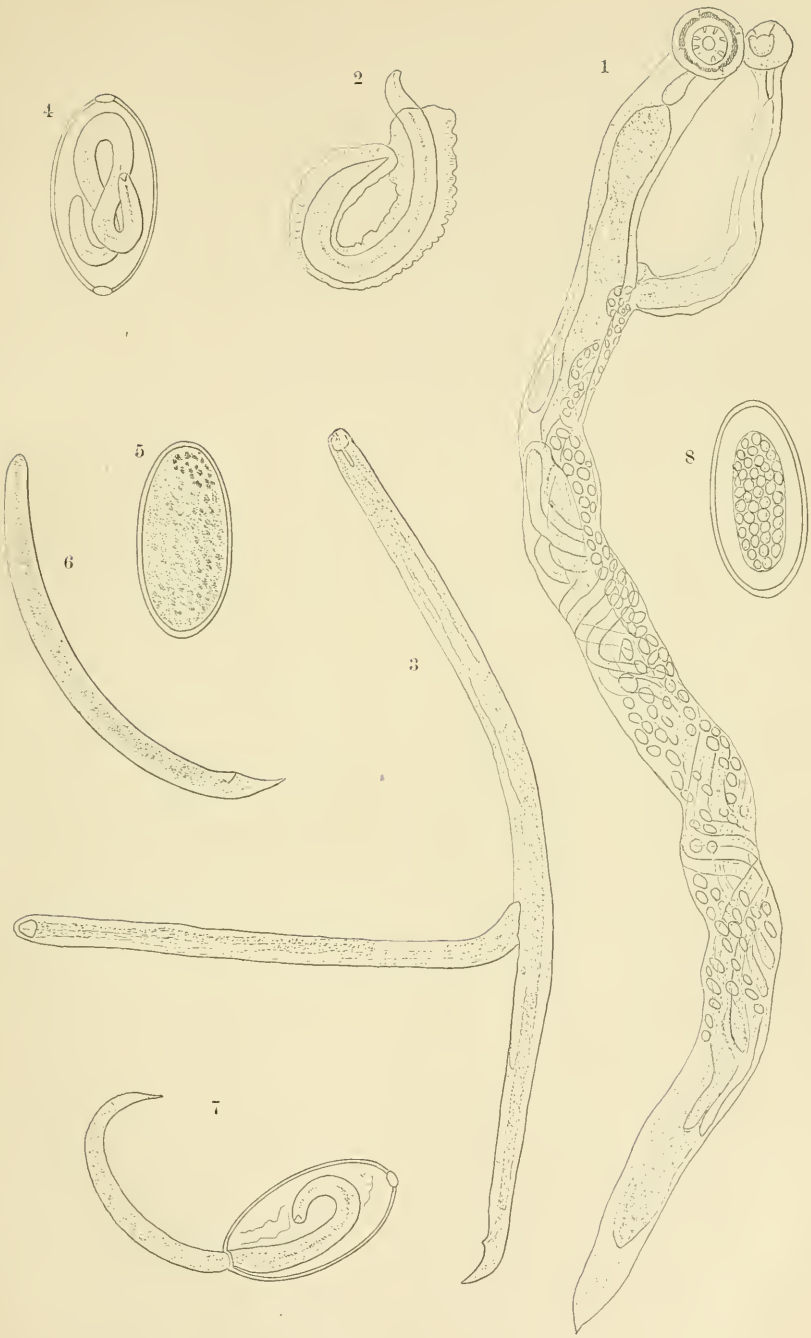
Fig. 3.—Smallest pair of Syngami ever seen; male .035 and female .055 inch in length. Found on the external wall of the œsophagus of a chick, (enlarged 172 diameters).

Fig. 5.—Egg of Syngamus immediately after passing out of adult female, (enlarged 318 diameters).

Fig. 6.—Embryo of Syngamus as found in the earthworm. Length .0118 inch, breadth at middle .00078 inch, (enlarged 200 diameters).

Fig. 7.—Embryo emerging from the egg, tail first, not a common occurrence. Body constricted in passing out through the valvular opening, (enlarged 318 diameters).

Fig. 8.—Egg in the mulberry state, (enlarged 318 diameters).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BULLETIN

OF THE

BUFFALO SOCIETY OF NATURAL SCIENCES.

VOLUME V. NO. 2.

THE GAPE WORM OF FOWLS (*Syngamus trachealis*): THE EARTHWORM (*Lumbricus terrestris*), ITS ORIGINAL HOST.

ALSO, ON THE PREVENTION OF THE DISEASE IN FOWLS CALLED THE GAPES, WHICH IS CAUSED BY THIS PARASITE.

BY H. D. WALKER, M. D., FRANKLINVILLE, N. Y.

NOTE.—The first paper on this subject was read before the Buffalo Microscopical Club, Nov. 11, 1884. In January, 1885, the Commissioner of Agriculture was notified of the results of the investigation. On the 15th of May, 1885, the writer was appointed by him to continue the work, which, he was given to understand by Dr. Salmon, would be brought out illustrated, and in the best form that was possible. Instead of this, no illustrations were given, and only a few of the experiments, without any of the arguments and conclusions. Dr. Megnin's article having been published in the previous year's report, that was accepted as correct, when in fact it was proved to be untrue by the production of the gapes in two chicks, from feeding earthworms sent them by the writer. The present publication is a result of the manner in which that report was treated.

In the following pages we present the results of experiments made for the purpose of determining the original host of the gape worm of fowls. We have endeavored at the same time to trace out the life history of this parasite, in its various stages from the egg to the perfect worm, also to devise means for the prevention of the disease caused by it among fowls. The object

of undertaking the work was two-fold. First, it was thought if its original host could be discovered the disease might be prevented to a great degree, and much good result therefrom. Second, the love of original investigation and a determination to work out the life history of this parasite, which, although well known in its mature condition in the trachea of fowls for nearly one hundred years, had thus far, in its embryonic state, remained unknown. The work has been exceedingly difficult, for several reasons. When the investigation was begun, I knew nothing about Entozoa. Microscopical work was also comparatively new. Living in a small village, I had no public libraries to consult, and was dependent for the literature of the Entozoa on a few books which I procured during the investigation. My profession also left me little leisure, and the most of this work has been done at such odd times as I could spare from other duties. I wish here to express my thanks to the eminent naturalist, Dr. Joseph Leidy, of Philadelphia, for many favors in inspecting my microscopic slides, and for advice and encouragement in the work. Valuable, indeed, were the services he rendered me. I am under obligations to Lord Walsingham, of England, for books to aid in the investigation. Friends in the Buffalo Microscopical Club, and neighbors, have also assisted me in various ways. I have freely consulted Dr. T. Spencer Cobbold's work on Parasites, and Dr. Pierre Megnin, "On the Gapes Disease in Gallinaceous Birds." Finally, I trust these pages will not be scanned with too critical an eye, for, doubtless, imperfections will be found. I can only say that I have honestly endeavored, according to the best of my ability, to place before the reader the life history of one of the humblest of creatures, a worm, but which, nevertheless, plays well its own part in this world of animated nature.

ZOOLOGICAL CLASSIFICATION AND HABITAT.

The animal kingdom is divided into several sub-kingdoms. One of these is called Worms (*Vermes*). This sub-kingdom is separated into classes, one of which is named Round Worms

(*Nematelminthes*). Another division into orders is made, among which are the Nematode Worms (*Nematodes*). This order contains, among other genera, that of Syngamus, of which our *Syngamus trachealis* is the only species at present known.*

Another name for this worm is *Sclerostoma*, or *Strongylus syngamus*. Syngamus trachealis has been found in the trachea of the following birds: the turkey, domestic fowl, pheasant, partridge, black stork, magpie, hooded crow, green woodpecker, starling, swift, and by myself, in the robin.

HISTORICAL REFERENCE.

The first public record of the Gapes was made by Dr. Wiesenthall, Professor of Anatomy at Baltimore, Md. In a communication dated May 21, 1797, and published in the Medical and Physical Journal in 1799, he says: "There is a disease prevalent among the gallinaceous poultry in this country called the gapes, which destroys eight-tenths of our fowls in many parts, and is most prevalent among young turkeys and chickens bred upon established farms. Chicks and poults, in a few days after they are hatched, are frequently found to open wide their mouths and gasp for breath, at the same time sneezing and attempting to swallow. At first the affection is slight, but gradually becomes more and more oppressive, and ultimately destroys; very few recover; they languish, grow dispirited, droop and die. It is generally known that these symptoms are occasioned by worms in the trachea. I have seen the whole windpipe completely filled with these worms, and have been astonished at the animals being capable of respiration under such circumstances." The above is a truthful description of the disease as it prevails in this country to-day.

In 1808, Mr. George Montagu gave an account to the Wernerian Society of a species of Fasciola, which infests the trachea of poultry, with a mode of cure. This led to its being noticed

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* The name of the genus Syngamus is derived from two Greek words, *συν*, with, together, and *γαμος*, marriage, and has reference to the peculiar union of the sexes.

in the systematic works of the day. Dr. Cobbold, from whose work on parasites this brief history was taken, has made some observations on this worm. In 1879, Lord Walsingham, of England, offered a prize of two hundred and fifty dollars, to be awarded by the Council of the Entomological Society of London, for the best essay, comprising a complete life history of the parasite causing the gapes. Mr. Charles Black and Dr. Pierre Megnin, a well-known French scientist, competed for the prize. The latter received the award. The conclusions at which he arrived in regard to the propagation of the disease, are as follows: First, that birds pick up mature Syngami filled with eggs, which are coughed out by those having the disease, or the eggs are taken in their food, or the embryos after they are hatched in water, and they are developed within them to the perfect form. Second, that no intermediate host, as perfect insects, larvæ, mollusks, or any other living agent, has any share in spreading the disease. In a supplement to the above, written about twenty months after, he says: "In the preceding memoir, we pointed out that the eggs ejected during the coughing fits hatch in water, and that the embryos, resembling an anguillula, may live in this medium for many months, because we have kept some alive almost a year, in a low temperature. The birds are infected by drinking the water containing these embryos."

This, then, is the conclusion at which Dr. Megnin arrives, after five or six years of study of the gapes in the various pheasantries of Central France, and around Paris Dr. Cobbold says, in his work on "Parasites," page 445: "A change of hosts is probably necessary, but in the first instance they either enter the substance of fungi or other vegetable matters, or they bury themselves in the soil a short distance from the surface." In Lord Walsingham's preface to the essay by Dr. Megnin, he says: "By Dr. Megnin's permission, his memoir is now published in a separate form, the subject of it being one which could not rightly be included amongst the publications of the Entomological Society, although at the time of offering the prize I was led, by information gathered from various sources, to think it possible

that the larvæ of some insect acted the part of host to the embryonic form of Syngamus." Dr. Joseph Leidy believed the embryos would be found in some intermediate host. The above comprised our knowledge on this subject when this research was begun.

PRESENT INVESTIGATION.

The present investigation was commenced during the summer of 1883. Great numbers of young poultry dying of the gapes, some of my neighbors applied to me for aid to arrest the disease. Knowing very little about the gapes, but having heard it was caused by worms in the trachea, I made a careful examination of their windpipes, and found numbers of the worms attached thereto by their sucker-like mouths. Never having studied the Entozoa, and having no works on them, I sent a specimen to Dr. Joseph Leidy, of Philadelphia, asking him its name, and where I would find information on the subject. He kindly replied, and referred me to Dr. Cobbold on "Entozoa," and an article by Dr. N. H. Paaren, in the American Entomologist, vol. 2, page 149. I immediately procured these, and reading the articles on that subject, could find nothing regarding its origin. I therefore again addressed Dr. Leidy, asking him for the desired information. On August 15th, 1883, I received his reply as follows: "The source of the gape worm (*Syngamus trachealis*), of chickens, has not been discovered. If you have an opportunity of investigating and determining its origin, you may do much service to science. It would be found only in the embryonic or larval condition, in some intermediate host." I thought this was not only a good field for microscopic examination, but also one which, should I succeed in the work, would be productive of much good. Therefore, I commenced an investigation of the coops and their vicinity, where the chicks suffered most from the gapes. About these I found three not improbable sources of the disease: First, the common earthworm (*Lumbricus terrestris*); second, the sow bug (*Oniscus asellus*); third, the garden slug (*Limax flavus*). My attention was especially directed to one coop, where the

chicks all had the gapes. This was placed on a grassy plot, but close by its side was a small space of bare ground, a few inches square. It seemed quite probable that here was the place where they obtained the parasite, so I dug into it and found it full of earthworms. I took some of these home and examined them with the microscope, as I did also Oniscus and Limax. I found that both the slug and earthworm contained parasites in abundance. None were found in Oniscus. To determine which one, if any of these, was the host, I procured some chicks from a neighborhood where no gapes existed, and fed each separately to the chicks. In neither of the chicks fed with sow bugs or slugs was any result produced, but the chick fed with earthworms developed symptoms of the gapes. To guard against error, all the chicks were kept in a barn where they had no access to the ground, and their food was corn meal mixed with pure water.

EXPERIMENTS IN FEEDING EARTHWORMS.

Exp. 1. On September 29, 1883, at 8.30 A. M., a chick about one week old was fed ten earthworms from the bare spot of ground by the side of the coop where the chicks had the gapes. The worms were carefully washed in water to remove all the dirt adhering to them, which might contain the eggs or embryos of Syngamus. On October 6th, at 7.30 A. M., six days and twenty-three hours after the feeding, I observed the first symptoms of the gapes. On October 7th, at 10.30 A. M., eight days and two hours after feeding the chick, and twenty-seven hours after the first symptoms of the disease, I killed it and found twenty-six gape worms. Of these worms, two only were found in the trachea; they were at its upper part, and were the largest. Ten or twelve of them were in the pharynx. The remainder were in the œsophagus, from its upper part half way down to the crop. All these were united in pairs, except one male and female.

Exp. 2. On October 9th, at 8 A. M., another chick, a little over two weeks old, was fed four earthworms from the same place,

with like precautions. At the same time of day on the 10th, it was fed six worms. On the 11th, 12th, 13th, 14th and 15th, it was fed ten worms daily. At the same time from the first feeding, a little less than seven days, it had the gapes. It was killed in eight days and twelve gape worms found, all in the trachea.

Exp. 3. November 13th, three chicks, two days old, were fed earthworms from my garden, eight, nine, and ten days, respectively. No symptoms of the gapes were produced, but to determine positively, the one fed nine days was killed, and no gape worms found. This experiment shows that all earthworms do not contain the embryos of Syngamus. To confirm this, earthworms from the same place have been repeatedly examined with the microscope, and none of the embryos found.

Exp. 4. Two mature Syngami were broken in pieces, so as to free the eggs. They were then placed on the surface of a dish filled with dirt, well moistened with water. After two weeks, some earthworms were placed in this dish and allowed to remain ten days. Three of these were fed to a chick, which was carefully watched for two weeks. No symptoms of gapes were discovered. Evidently, the embryos had not obtained access to the earthworms in sufficient numbers to produce the disease in chicks.

Exps. 5 and 6. On December 13th, two chicks, four weeks and four days old, were each fed six earthworms from the infected spot, with the same precautions as before. On the 14th, 15th and 16th, the feeding of six worms was repeated, making twenty-four to each chick. On December 20th, about seven days, as before, they had the first symptoms of the gapes. One was now killed, and twenty-two Syngami were found. On December 24th, eleven days from the first feeding, the other was killed, and sixteen found. All of them were united, and in the trachea. None were found in the lungs, but it is probable they were there, and want of experience in the search prevented their discovery.

Exps. 7, 8 and 9. On April 21st, 1884, fed three chicks, two

days old, each five worms from the same place from which the others were obtained. Repeated the feeding on April 22d, 23d, 24th, 25th, 26th and 27th. On April 28th, about seven days from the first feeding, all had the gapes. One was now killed and Syngami found in the trachea, also three pairs in the lower part of the left lung and one pair in the lower part of the right lung. Continued to feed the two remaining chicks earthworms until May 5th, just two weeks from the first feeding, when one was killed and the lower part of the trachea found crowded with Syngami. One of these measured seven-eighths of an inch in length, and two or three others three-fourths of an inch They contained fully developed eggs, as did also the excretions of the chick just before it was killed. This proves that the embryo of Syngamus in the earthworm, is developed to maturity in two weeks from the time it obtains entrance to the chick. The last chick was killed seventeen days from the first feeding, when *in articulo mortis*. In the lungs of each of those killed at fourteen and seventeen days from the first feeding, embryo Syngami were found in various stages of development.

Exp. 10. On July 16th, fed a chick ten earthworms, and repeated the feeding for nine successive days. The gapes observed on the seventh day, as usual. On July 26th, ten days from the first feeding, I killed this chick and found a large number of Syngami in the trachea, and also the embryos in different stages of growth in the lungs.

Exp. 11. In order to see if Dr. Megnin's theory was correct, that the eggs would develop within the fowl, I fed a chick about three weeks old, on July 29th, three perfect Syngami, containing many thousands of eggs. This chick was carefully watched for five weeks, and no symptoms of gapes observed. That this result is correct, we have additional proof in exp. 8, in which large numbers of perfect eggs were found in the excretions of the chick, on the fourteenth day after feeding earthworms containing the embryos of the gape worm. I believe, however, if the eggs should in any manner be retained so as to hatch before they passed into the proventriculus, the gapes would be pro-

duced, but think such a case must be very rare, and would be unlikely to occur unless the embryos were fully developed in the egg before they were taken by the fowl.

Exp. 12. Three young robins (*Turdus migratorius*), in the nest, were fed several infected earthworms each, daily, for twelve days. These earthworms were taken from the same place as those given the chicks. No well marked symptoms of the gapes were observed. Two of them were killed, and three or four gape worms found in the trachea of each. A number were also found in process of development in the lungs. These birds live almost entirely on earthworms during a part of the year, and I wished to know whether they would serve as a host for the parasite, and thus be instrumental in spreading the disease. The trachea of robins differs, in its size and anatomical structure, from that of poultry, especially at its lower part, where the last ring dilates and forms a second larynx. Syngami generally collect from the lower part of the trachea to its middle, and the gapes is simply the effort of the bird to obtain more air through this passage, which is obstructed by these worms. It is evident, therefore, that birds which have a larger trachea would harbor a greater number of syngami without suffering from the gapes. We see this is the case in chicks after they are several weeks old, for syngami can often be seen in their windpipes by opening their mouths and straightening out their necks. Several worms can thus be seen in large chicks, with very little embarrassment to respiration. It is also not improbable that, although the embryos may penetrate the œsophagus, pass to the lungs and thence to the trachea, the greater part may be coughed up and swallowed before they are able to obtain a hold on its mucous membrane. We know, from an examination of chicks, that very many of them are thrown off in this way.

Exp. 13. On July 4th, at 5 P. M., fed a chick, about four weeks old, a large number of syngami, just hatched, by turning the water containing them down its throat. On July 11th, at 7 P. M., this chick commenced to have the cough or sneeze characteristic of the gapes. July 12th; coughed much more. On July 13th,

at 9 A. M., eight days and sixteen hours after the feeding, I killed the chick and found one single and twenty-nine pairs of syngami.

Exp. 14. On August 14th, at 7 P. M., fed a young robin, just from the nest, a large number of embryo syngami hatched in water, as in the preceding experiment. It was kept in a cage hanging under a tree, and fed by the old bird.

August 22d, morning: Robin had some symptoms of the gapes, such as rapid breathing, an occasional gape and shake of the head, and was inclined to sit on its perch, instead of standing up, as usual. August 23d: breathed more rapidly, and evidently quite ill. August 26th: Robin continued to grow weaker and breathed more rapidly, and at times gaped, but the gaping was not as prominent a symptom as in the case of chicks. The robin died the morning of the 29th, the fifteenth day from the feeding. On examination, three fair sized syngami were found in the trachea, not enough to fill it up, so as to produce much gaping. The rapid breathing, which was the most prominent symptom, was readily accounted for by extensive deposits in both lungs, more especially the right. The lower part of each lung was affected, and the diseased condition, doubtless, resulted from the irritation of the parasites.*

Exp. 13 proves that the embryo of Syngamus does not *necessarily* have to pass through an intermediate host; that the earthworm is simply a bearer, in which it lives in its embryonic condition, and through which it obtains access to fowls. This chick was kept in the barn, and all other sources of the disease excluded, which was not the case with the robin. The time from the feeding to the production of the disease in the chick was the same as when earthworms were fed, which is good evidence that it is the embryo instead of the egg in those, which causes the

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*This condition resulting from parasites is mentioned by Dr. N. H. Paaren, in the American Entomologist, Vol. II, page 149; also, by Dr. George M. Sternberg, from M. Lanlaine, in an article on the "Production of Tuberculosis by Inoculation," in the American Journal of Medical Sciences, Vol. LXXXIX, page 18.

disease. It may further be stated that in the examination of many infected earthworms, I never yet found any to contain the eggs of Syngamus. In dissecting the robin, I found an embryo just emerging from the œsophagus into the lung. It was a short distance above the proventriculus, was sexually developed, being a male, and thus affords convincing proof that they enter the lung this way. In a chick, I also found a pair of Syngami just united, on the posterior part of the œsophagus, which had the appearance of having been penetrated by these worms. I have also found the embryo lying beneath the mucous membrane of the œsophagus.

ARTIFICIAL CULTURE.

Exp. 15. On September 23, 1883, a mature Syngamus filled with eggs was placed in a small glass dish with a little water, for the purpose of observing the development of the embryo, the structure of the young worms and the time required for them to hatch. We also thought that by comparison in this way they could be more positively identified in the earthworm. The dish was kept covered in a warm room (65° to 70° Fahr.), and occasionally placed several hours in the sun. On October 14th, three weeks from placing them in water, they commenced to hatch.

Exp. 16. June 11, 1885. Placed two mature syngami in a small glass dish of water, and kept them in a room where they were not exposed to the direct rays of the sun. On June 28th, seventeen days from the time they were placed in water, they commenced to hatch.

Exp. 17. December 1, 1884. Placed several embryos, found coiled up in the muscular sac of the segmental organs of the earthworm, in a small glass dish of water, and kept them loosely covered, in a warm room. These embryos were thought in the beginning of the investigation to be those of syngamus, and this method was adopted to see if any growth or development of structure would take place in water, whereby we might decide the question. In from five to seven days they grew to many

times their length, and were developed into male and female. A small number of eggs were also seen in different stages, within the oviducts and scattered about the bottom of the vessel. These worms correspond with the description and figures in the Micrographic Dictionary under the head of *Anguillulidiæ*, and are thus excluded from being the embryos of syngamus.

Exp. 18. Several embryos taken from the intestinal canal of the earthworm, where they were found surrounded by mucus, were placed in a glass dish of water and kept, as in the foregoing experiment, seven days. These embryos after a few hours coiled themselves up at the bottom of the dish, and for the most part of the time remained in this condition, occasionally uncoiling and moving about a short distance. No growth or development of structure took place. These are the embryos which it is believed are identified as those of syngamus.

Exp. 19. Placed several embryos from the intestinal canal of the earthworm, like those in the preceding experiment, in an incubator, and kept them at 105° Fahrenheit for seven days, at which time they were alive, but no change of structure or development had taken place.

Exp. 20. One pint of blood from a calf was allowed to stand in a glass fruit jar, until the solid portion had settled, leaving the serum at the top. On May 5th, at 9 A. M., one dram of this serum was placed in a Syracuse solid watch glass, with ground edges, containing twenty of the last described embryos. These embryos had been kept in the watch glass in water one week, and were nearly all lying quietly coiled up about its center. The most of the water was removed by a pipette before the serum was added. As soon as this was done, the embryos uncoiled and became quite lively, as though they had at last found their natural element. The watch glass was placed in an incubator, covered by another one with ground edges, but leaving a small space for air. The temperature had previously been regulated so as to remain at 105° Fahr. At 9 P. M., on examining them with the microscope, they had slightly increased in size and were commencing to moult. On May 6th, at 9 A. M., they were again taken

from the incubator and examined, when the process of moulting had still further advanced. At 4 P. M., I found them all dead. The culture fluid had become putrid.

Exp. 21. May 7th, 4 P. M. Completely satisfied that I was on the right track, I removed four more embryos from an earthworm and placed them in another portion of serum, and in the incubator as before. On May 8th, at 9 A. M., removed them to another watch glass containing fresh serum, by taking them up under an inch objective with a small splinter of wood whittled to a fine point. At 9 P. M. the same day, they were again removed to fresh serum. One was found dead, another had molted, and the two others had nearly completed that process. May 9th, 9 A. M. They were seen to have increased in size, and were removed to another portion of serum. These embryos lived between four and five days in the incubator, and were about moulting the second time. I think they were sufficiently developed to show that they were the embryos of syngamus. One of them measured about .0139 inch in length, and the exuviæ, in which it still remained, about .0227 of an inch.

Exp. 22. Four of the embryos from the earthworm were placed in one drachm of egg albumen, after it was beaten to render it fluid. They were placed in the incubator as before, and changed to fresh albumen daily. After being kept in this way six and one-half days, they were alive, but there was no change in their structure or size, or any appearance of moulting perceptible. Evidently, the proper food for their metamorphosis and growth was not contained in this fluid. In these culture experiments the incubator used was one in which the heat could not be thoroughly controlled. It is believed, with a good one and more experience, better results could be attained. It is also thought the blood serum of a fowl would be the best adapted for this purpose.

This method of artificial culture of animal parasites is believed to be new, and if varied according to the different circumstances in which they are found in nature will, we think, render easy the solution of some of the most difficult questions, as to the life

history and embryonic forms of many of these creatures. The subject is of great importance, for large numbers of both human beings and animals perish each year through their agency. Moreover, it is not far removed from that great question which occupies so prominent a position before the medical profession at the present time. I refer to the germ theory of disease. The one is an animal, the other a vegetable parasite. The method of artificial culture is now being used for working out the latter; I see no reason why it cannot be successful in the former.

EMBRYOLOGY AND DEVELOPMENT OF SYNGAMUS.

The egg is formed out of the granular material seen near the extremity of the ovarian tubes. It is shaped into small round bodies which pass down towards the uterus, within the horns of which they are supposed to become impregnated, and receive the hard external coat called the shell. The egg in syngamus becomes perfect under favorable circumstances about fourteen days after earthworms containing the embryos are fed to a chick. It is then oval, about .004 inch in its long, and .0025 inch in its short diameter. At each end is a valve or lid which drops off when the embryo emerges from the egg.

We believe the egg of syngamus, within the perfect worm just arrived at maturity, does not contain a developed embryo. We are aware it is generally thought by naturalists that the eggs furthest advanced in a mature syngamus contain the perfect embryo, already moving actively about within the shell. We will briefly give the reasons for our opinion. In experiment No. 8, it will be seen that a chick, fed earthworms containing the embryos of syngamus, developed the gapes, and in fourteen days from the time of the first feeding great numbers of the eggs of syngamus were found after they had passed through the fowls' intestines. These eggs passed from perfect worms, which were found breaking up in the trachea of the chick killed the same day. Now the eggs which passed through the chick, and those found about the perfect worms in the trachea, showed no sign of embryonic formation. Moreover, we will say that after

the examination of many perfect worms removed from the trachea, we have never found the embryo developed within a single egg at that time. In our experience, it takes these eggs not far from three weeks, varying somewhat with the temperature, to mature and bring forth their embryos. We believe Syngami in which active embryos were found within the egg, had been for many days mature, and probably kept in a moist condition, either within the body of the bird or external to the same. The embryo of the lung worm of calves (*Strongylus micrurus*), is fully developed in the egg while in the lungs of the calf. Possibly reasoning by analogy has had something to do with the opinion heretofore entertained concerning Syngamus. It is evident the eggs scattered over the ground in the natural way, hatch much quicker during the hot months of summer than later in the season. Indeed, it is quite probable that most of these last perish on account of the cold, without the formation of an embryo.

DEVELOPMENT OF THE EMBRYO.

The process of development from the egg is as follows : The yolk undergoes segmentation; that is, it becomes divided into 2, 4, 8, etc., round masses or spheres, this division being continued until it assumes the mulberry state. The embryo is developed from this around the inner part of the shell, in the form of a circle. Before it emerges the embryo usually coils itself within the egg, like a figure 8, from which it generally comes out head first. The time required for the perfect egg to pass through the different stages until the embryo issues from it varies, as heretofore stated. On one occasion a few of the embryos came forth in seventeen days. The embryo on emerging resembles an Anguillula, but its movements are not as rapid as most of the worms belonging to this order. It is about .011 inch in length, and .0005 inch in width at its middle. The posterior half of the body is filled with a fine granular matter. After the embryos have been in water a few days they moult, losing about .0005 inch in length; their tails are also more blunt. Sometimes they pass through the first moult while coming out of the egg, leaving the old skin within.

THE EMBRYO IN THE EARTHWORM.

The embryo as found in the earthworm differs but slightly in its structure, so far as can be discovered, from the embryo which has passed through one moult after the egg has hatched in water. We think the granular material extends throughout the whole length of the body, instead of only its posterior half, as when hatched in water. It is also a little larger, about .0118 inch long, and has a diameter of about .00078 inch at the middle of its body. They differ somewhat in their size, which probably depends on how long they have been in the earthworm, and I think those residing in very large earthworms are larger than those living in smaller ones. The method of finding them in the earthworm is as follows: Select a poultry yard where chicks have had the gapes for several years,so that the earthworms may have plenty of the parasites. From near the surface of bare spots of ground which chicks with the gapes have frequented, take some of the earthworms and examine them with the microscope. The following method is recommended: Throw the earthworm to be examined into a solution of common salt (Chloride of Sodium), having the strength of about two ounces to the pint of water. When it ceases to move rinse in pure water ; then, with sharp-pointed scissors slit the skin the entire length of the worm down the back. Spread out on each side, to expose the digestive organs. In order to intelligently proceed, we will briefly describe these: They consist of the mouth, pharynx, œsophagus, crop, gizzard and intestine. Directly connected with the œsophagus, about its middle and posterior part, are found six white bodies, three on each side, called the œsophageal or calciferous glands. The œsophagus passes directly into the crop, which is just in front of the gizzard. Following this is the intestine, which passes through the remaining portion of the worm. We cut off the intestine just back of the gizzard, and taking small pieces, about one-eighth inch long, place them on a watch glass with a little water, pick them well in pieces, and examine carefully with an inch objective. We generally find the embryos a short distance below the gizzard, not often more than half way to the

tail. There are numerous kinds of parasites which inhabit the earthworm, some of them numbering thousands in a single worm. We have also found the earthworms in different localities to harbor very different kinds of parasites. The method of distinguishing the embryo of Syngamus is its size, description as here given, and general appearance as seen in the engravings. We think it is taken in by the earthworm with its food, and passes down into the intestine, where it remains until transferred within its host to the digestive organs of some bird, or after a time passes through into the soil and perishes. We believe this method of taking in the embryo by the earthworm is the common law in nature, through which all creatures, man included, obtain their intestinal parasites.

THE EMBRYO OF SYNGAMUS IN THE FOWL.

The embryo passes into the crop within the intestine of the earthworm. We wish to determine at what point it leaves the digestive canal and passes into the lungs and trachea. We have never been able to trace the embryo below the œsophagus, after many examinations of chicks dead of the gapes If we admit that they do not pass through the proventriculus and gizzard alive, which I have no doubt is the truth, there are only two organs, the crop and œsophagus, through which they could gain admission to the lungs. The crop is simply a dilatation of the œsophageal structures, and acts as a reservoir for the food. We believe the embryo passes through the œsophagus just above the proventriculus, for the following reasons: The distance to the lung structures is very short, only the thin wall of the œsophagus intervening. The orifices of the lenticular glands of the œsophagus are of greater diameter than the embryo, so it could readily enter through them. That such is the case we know, for we have found them beneath its mucous membrane. The pulmonary bronchi ramify over the outer surface of the œsophagus, through the substance of which there are numerous tubular structures, which, it is not improbable, may be connected with these. We have seen the embryo just emerging from the œso-

phagus into the lung, and have in all the chicks carefully examined for that purpose, after dying of the gapes, found several echymosed spots, which looked as though the embryos had passed through. We have also found them recently united on the outer wall of the œsophagus, one pair being the smallest we ever saw. In dissecting some chickens dying of the gapes, we have found the œsophagus adhering to the lungs, as we believe from the inflammation caused by the passage of the embryos. Both male and female embryos do not develop beyond a certain point until union takes place. After this they pass through the bronchi into the trachea, where they attach themselves to the mucous membrane and attain maturity.

ANATOMICAL DESCRIPTION.

We shall not attempt any extended anatomical description of Syngamus. The illustrations accompanying this investigation will show its appearance in the different stages. We will briefly say that the mouth in this Genus is large, circular, and surrounded by four outer membranous and six inner chitinous lips. The young worm has eight inner lips, two of which uniting with two others reduces the number to six in the adult worm. Within, it is hollowed out, and contains, around the opening to the digestive apparatus, eight lance-like organs, which are supposed to pierce the mucous membrane for extracting the blood of its host.

The Male.—The male has been found coupled on the external wall of the œsophagus when .035 inch long, and .002 inch wide. At maturity it attains the length of about .24 inch, and a breadth of about .02 inch. The diameter of the head exceeds that of the body, which is round, and its posterior part, containing the genital organs and anus, is united to the vulva of the female by a hood-like organ, with several ray-shaped expansions. Within is seen the digestive and internal genital organs.

The Female.—The female has been found united with the male on the œsophagus when .055 inch long and .0025 inch in

width, and in its adult state sometimes measures .875 inch in length, by nearly .045 in width. It is of a bright red color from the absorption of the hæmetin of the blood upon which it lives. When mature, it is irregularly cylindrical, curved and often variegated by the white winding uterine horns filled with eggs. The tail is mucronate, and just beneath this is the anus. The vulva is situated a short distance back of the head, and is permanently united to the caudal extremity of the male. The digestive and genital organs can be traced within.

PREVENTION OF THE GAPES.

The very best results which can be attained from the study of disease is its prevention. If the only way in nature by which fowls contract the gapes is from eating earthworms containing the embryos of syngamus, it follows if none of these were eaten the disease would become extinct. We believe this is the only method designed by nature, although we are free to admit if the embryos should be taken in any other manner the disease would be equally liable to occur. Adopting this view there are two methods of prevention, either one of which will prove effectual. First, keep young fowls from the ground where earthworms are infested by the embryos. Second, destroy the earthworms containing them, when the fowls could be allowed their liberty. We had thought a third method might be added, namely, to mix with the bird's food some anthelmintic, which, if worms containing the embryos were eaten, would destroy them without injuring the fowl. This opinion was changed after the experiments detailed below were concluded.

The first method consists in either keeping them on wooden floors, or some grassy plot or ground where the disease has never existed. The second method, that of destroying the earthworm, involves the question as to what is the best method of doing this. The article to be chosen must be cheap, effective, readily applied, and safe to use. We have experimented with three different substances, each of which possesses to a considerable degree these qualities. They are common salt (chloride of so-

dium), lime (oxide of calcium), and wood ashes (mostly composed of potassa and its carbonate). In the experiments medium-sized earthworms were used and the embryos of syngamus were taken from the intestine of the earthworm.

EXPERIMENTS WITH EARTHWORMS AND EMBRYOS OF SYNGAMUS.

Exp. 1. An earthworm just dug, and with the dirt still adhering to it, was thrown into dry lime which had been slacked for several weeks. At the end of twelve minutes it was dead.

Exp. 2. Another earthworm was thrown into lime-water; in seven minutes it ceased to move.

Exp. 3. An embryo of Syngamus trachealis was placed in lime-water; it was observed for two hours, at the end of which time it was still alive and active.

Exp. 4. An earthworm placed in a solution of common salt having the strength of one-fourth pound to the gallon of water. In six minutes it was dead.

Exp. 5. An embryo of Syngamus placed in the above solution lived thirty-three minutes.

Exp. 6. An earthworm placed in a solution of salt having the strength of one-half pound to the gallon of water lived four minutes.

Exp. 7. An embryo of Syngamus placed in the above solution ceased to move in fourteen and one-half minutes.

Exp. 8. An earthworm placed in a salt solution having the strength of one pound to one gallon of water lived about three minutes.

Exp. 9. An embryo of Syngamus placed in the above solution lived three minutes.

Exp. 10. An earthworm thrown on a portion of dry salt ceased to move in somewhat less than three minutes.

Exp. 11. An earthworm thrown on dry ashes lived about twelve minutes.

Exp. 12. An earthworm placed in lye made by pouring warm water on wood ashes and letting it stand one hour, the propor-

tion being one-half pound of ashes to one gallon of water. The earthworm ceased to move in three minutes.

Exp. 13. An embryo of Syngamus placed in the above solution was apparently unaffected at the end of twelve hours.

Exp. 14. An embryo of Syngamus placed in a watch glass containing a mixture of water and asafœtida, many small pieces of the latter being scattered over the bottom. At the end of one hour it was unaffected, although almost constantly in contact with the lumps of asafœtida.

Exp. 15. An embryo of Syngamus placed in a watch glass with water, and several small pieces of an onion making a strong solution were added to the same. At the end of six hours very little abatement in the vigor of its movements was perceptible. In twelve hours it still lived, but its movements were very slow.

The result of the above experiments may be stated as follows: Lime, salt, and ashes are all effective in destroying the earthworm. Lime water and lye of the strength used seemed to have very little effect on the embryo of Syngamus. Doubtless a stronger solution of ashes would kill it, and it is probable that lime in substance would also be effective. Salt not only destroys the earthworm, but it also kills the embryo of Syngamus. The anthelmintic power of asafœtida and the onion has disappointed us much. The latter belongs to the same family (*Allium*), and has similar properties to garlic, which has been so highly recommended as a specific in this disease. Ashes, lime or salt may then be used. The first two can be spread over the ground. Lime, in the form of lime water, is exceedingly cheap, but, exposed to the air or in the soil soon combines with carbonic acid, forming carbonate of lime, which is probably harmless to the earthworm. We believe salt is more reliable, and it has also the additional advantage of destroying the embryo of the gape worm in the soil. It can be used in poultry yards in the proportion of one pound to the gallon of water, or, if the soil is very moist, two pounds would be better. If a large extent of ground is to be treated, the salt could be scattered in substance over the surface and left to be

dissolved by rain or plowed under, taking care that none of it is eaten by fowls. All poultry dying of the gapes should be burned, and not left upon the ground, or even buried deep as advised by some, for the eggs may hatch and the embryos be taken by the earthworm to the surface to propagate the disease.

CONCLUDING REMARKS.

Before closing, we wish carefully to examine a few points concerning the life history of Syngamus and the propagation of the gapes. First, do fowls contract the disease by picking up the eggs, or mature Syngami containing them? Dr. Megnin's parrot was claimed to have taken the disease from eating, on August 7th, four mature Syngami filled with eggs. The first symptoms of the gapes manifested themselves on August 28th, twenty-one days after the feeding, and the bird died September 10th, on the thirteenth day of the disease. We believe if the eggs were retained and hatched before they reached the proventriculus, the gapes would result. But we think such a case is exceptional, and not the way in which the disease generally occurs. In proof of this, we will not only bring forward the chick-fed mature Syngami (see feeding exp. 11), but also the general fact that chicks, about fourteen days after they take in the embryos of Syngamus, have large quantities of mature eggs pass through their intestines into the soil. According to Dr. Megnin's theory, these eggs should hatch within the chick; it would thus become self-infecting, and would almost necessarily die. On the contrary, after chicks are a few weeks old they generally recover, their windpipes being large so that the usual number does not very materially interfere with their respiration. That the eggs are not contained in the earthworm and thus taken we believe is true, for in the examination of very many infected earthworms during the past two years we have never found an egg of Syngamus. It is also evident that the time required to produce the gapes by feeding earthworms is too short for the eggs to hatch and the embryos to pass through their different stages. We consider it unnecessary to bring forward

further proof on this point, for Dr. Megnin himself abandons the theory. He says, in a supplement to his essay, written about twenty months after it (see Report of U. S. Department of Agriculture, 1884, page 283): "We pointed out that the eggs ejected during the coughing fits hatch in water, and that the embryo resembling anguillula may live in this medium for many months, because we have kept some alive almost a year in a low temperature. The birds are infected by drinking the water containing these embryos." He also denies that any other animated medium, except the birds themselves. has any share in spreading the disease (see same Report, page 280). That the gapes can be artificially produced by feeding the embryos of Syngamus hatched in water to chicks, we readily admit, for we have proved such is the case by experiment 13. But we deny that this is the natural way in which they contract the disease. To prove the correctness of our conclusions, we have eight carefully conducted experiments with chicks by feeding them earthworms from an infected spot, in which every other mode of taking in the embryos was excluded, the gapes being invariably produced in each case. Now, if this is not the natural way, then the earthworm must be an accidental host. That such is not the case we consider proved by finding the embryos of Syngamus living in the earthworm at all times of the year, winter as well as summer. They have been found in nearly all the earthworms of an infected spot one year after any cases of the disease in the immediate vicinity. We have found twenty of these embryos in a single earthworm, and often five to ten. It makes no difference whether the embryo is taken in water which the bird drinks, or in the intestine of the earthworm; the effect is the same. Furthermore, it is also in accord with the habits of many worm parasites that a bearer aids them in obtaining access to their final host, and the greater number of Nemetoid worms, to which class Syngamus belongs, are directly developed from their embryos without any metamorphosis necessitating a change of hosts, in which respect they are unlike the Fluke and Tape worms. There is no food more natural

for fowls than earthworms. Chicks two days old eat them greedily.

Finally, *it cannot be denied* but that we have effectually disproved Dr. Megnin's conclusion that no other animated medium except the birds themselves has any share in spreading the disease. We will recapitulate the several points we consider established by this investigation.

First, That the earthworm is the original host of Syngamus trachealis is proved by eight separate successful experiments, in feeding them to chicks. None of the chicks fed earthworms from the infected spot failed to have the gapes in seven days. That all earthworms do not contain the embryos of Syngamus, proved by feeding three chicks earthworms from a place where no gapes existed. They failed to have the gapes. That the robin (*Turdus migratorious*), may act as a host for Syngamus, and thus be instrumental in spreading the disease, is proved by feeding three robins and finding full grown worms in their tracheas. That the earthworm is only a bearer, or means of conveying the embryo to the fowl, is proved by feeding the embryos hatched from the eggs to a chick and thus producing the gapes. That they pass through the œsophagus is demonstrated by finding them beneath its mucous membrane, and also in the act of passing through into the lungs. The embryo of Syngamus in the earthworm has been identified by tracing it through its different stages, from the earthworm to the trachea of the chick, and also by artificial culture. That the embryo of Syngamus in the earthworm is but slightly affected by the anthelmintics which have been used to prevent and cure the disease, as asafœtida and garlic. They cannot be relied on for this purpose. Lastly, any locality where the gapes prevails can be rendered safe for fowls by destroying the infected earthworms in the ground with common salt.

The life history of Syngamus trachealis is as follows: Earthworms containing the embryos are eaten by the fowl. The embryos are liberated from the intestine of the earthworm and work their way through the œsophagus into the lungs and

bronchi. During this passage, or while in the lungs, they pass through the nympha stage and acquire sexual maturity. The male and female then unite and attach themselves by their sucker-like mouths to the mucous membrane of the trachea. Between six and seven days are required from its entrance into the fowl until its attachment to the trachea In about seven days more the eggs within the body of the worm become mature. They are coughed up into the mouth, swallowed by the fowl, and pass through it into the soil. In about three weeks, the time varying somewhat according to the temperature, these eggs, exposed to the moisture and sun, hatch; the embryos are taken in their food by the earthworm, where they remain until picked up by some bird, when the above process is repeated.

Some years one-half or two-thirds of the young fowls in certain localities are destroyed by this disease. This investigation proves that if they were kept from eating infected earthworms, that terrible scourge of poultry, the gapes, would be entirely prevented. Not only this, but it serves as a key to unlock the mysteries surrounding several other diseases, caused by parasites belonging to this family; namely, the lung worm of calves (*Strongylus micrurus*), the lung worm of hogs (*Strongylus elongatus*), the lung worm of sheep (*Strongylus filiaria*), the grouse disease (*Strongylus pergracilis*). Great numbers of calves, hogs, sheep and grouse, are yearly destroyed by these parasites. Their original hosts have never been discovered. From certain inquiries which I have made, I venture to predict that the earthworm will be found to be their original host.*

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* Since the above was first written I have found the embryo of *Strongylus micrurus* living in the earthworms of an infected pasture.

VENTRILOQUIAL AND IMITATIVE POWER OF BIRDS.

BY E. E. FISH.

Those who have observed the habits of birds know that they possess in considerable degree the power of imitation, but only at a recent period have naturalists recognized in them the possession of that rarer gift, ventriloquism. Most of the thrush family (*Turdidæ*) have to some extent this power, though some species rarely exercise it. When we hear the two thrushes (*Turdus fuscescens* and *Turdus mustelinus*), we look for them much higher in the trees than they really are. Before people become accustomed to this voice trick of these thrushes, they are often perplexed in locating the singers.

I remember one extreme instance: a wood thrush was singing his differently-keyed strains with great power and sweetness. I was looking through the branches of a thick hemlock, expecting to see him up thirty or forty feet in the tree. Instead of this elevation, he was within three or four feet of the ground, not twenty feet from me. For a long time he continued his songs, but all the time with this ventriloquial effect.

The golden crowned thrush (*Sciurus aurocapillus*) has a habit of throwing its voice to a great distance. The clear military notes "I see! I see!" will sometimes startle you with their apparent nearness, when in fact the bird may be in quite another part of the woods; then again, when the bird is within a few feet of you, the song will appear to come from a distant locality.

Even the familiar robin (*Turdus migratorius*) often makes use of this power with good effect. When he sings at mating time, or to attract attention, or from his innate love of song, he will carol away with such an *abandon* and fullness of tone that he appears to be much nearer than he really is; but when he sings exclusively for his mate, or for the newly fledged young whose

presence he wishes to conceal from others, the song is low and tender, often half smothered, or made to appear in another place.

The cat birds, which are among the most interesting as well as the most intelligent of the feathered tribe, have in individual instances, probably, arrived at a greater degree of proficiency in this art than any others of the family. They not only imitate well many notes and calls of other birds, but by modulating their tones they are capable of producing great deception in regard to their whereabouts. One day while watching some robins and goldfinches bathing together in a little creek, I heard a cat bird warbling very sweetly, but apparently at a great distance away As a treeless meadow lay in the direction from which the song proceeded, I wondered where the bird could be hidden, and sweeping a field glass over the stretch of meadow, I failed to locate him. To my surprise, I finally discovered the singer in a little thorn bush not ten feet from the place where I was standing, though the sound indicated the distance to be many rods. On looking through the bush tangled with vines, I found the mate sitting on her nest of eggs. The male, while singing to her, had been throwing his voice to a distance, evidently to mislead intruders. It was a clear case of ventriloquism exercised with a motive, for as soon as he knew the nest was found he flew to an oak some distance off and commenced a loud rollicking song, moving about from limb to limb, doubtless hoping to divert my attention from the nesting place.

At least two of the wrens (*Troglodytes aedon* and *Troglodytes hiemalis*) possess more or less ventriloquial power I remember how I once searched for a winter wren that was singing in a cedar thicket I heard the song first on one side then on another, always seeming to be above me, when in reality the bird was all the time on an upturned root of a little sapling, within plain sight. Several times afterwards I heard this wren go through a similar performance.

In his "Rambles About Home," Dr. C. C. Abbott relates a very interesting experience on this subject with the yellow-

breasted chat (*Icteria virens*). "From the branch of a tall locust a chat warbled a series of sweet, liquid notes, then squealed like a squirrel and yelped like a dog; following this with a wild outburst of glorious melody. While listening and wondering what next would greet my ears, I was surprised and startled by hearing the same strange sounds repeated, but at some distance off. Another chat farther down the path was singing in the same strange way. Another it must be, for the first is still in sight in the same locust tree, flitting carelessly about and apparently silent. Curious to hear the new comer I passed on, when the sounds were heard in the opposite direction. I retraced my steps, and now the strange medley came from the low bushes about me, and while looking carefully for the unseen chat that seemed so near, there came floating down to me from the tall locusts' topmost branch the same series of odd sounds and sweet warblings. The truth was now clear; the one bird had uttered every sound I had heard, and by his ventriloquism had for the time completely deceived me. My study of this habit and of its use now commenced, and for long weeks I watched him to test in every way his ability to mislead one by the exercise of this peculiar power. A little later the female appeared, and the two quickly selected a suitable spot in a tangled mass of blackberry briers at the foot of the locust tree, and built a commodious but roughly constructed nest. While the mate was sitting, the male chat seemed more animated than ever, and jealous of any intruder he threw his voice in every direction other than towards the nest, whenever anyone came too near. By watching from a concealment, I found that when not disturbed they uttered fewer strange cries of imitation, and seldom exercised their ventriloquial powers, but however suddenly I appeared from my concealment, there was an equally quick uttering of notes of distress, coming as it seemed from a point several yards distant. Vary my experiment as I would, it mattered not; the bird was thoroughly conscious of its ventriloquial powers, and trusted far more to it than to flight to avoid and mislead any intruder."

In discussing this subject further, Dr. Abbott thinks that

through the lapse of ages the birds have, through experience, learned some of the simple laws of sound. "They know as well as man does that certain notes can be heard at a greater distance than others. This knowledge of one of the properties of sound, simple as it is, is the starting point in the acquirement of mimicry, which is the intermediate stage between ventriloquism and the ordinary vocal utterances, including their songs."

Probably very few birds of any species have arrived at such proficiency in this art, for art it certainly is, as have the chats and some of the wrens, which seem able to throw their voices in any direction. Many individuals of other species are only able to modulate their tones so as to seem distant or near, like the crooning of the loons or piping of certain plovers on the wing, and the cooing of the Carolina doves.

Bradford Torry, who is a close observer and has a quick ear for bird notes, writes of one of the vireos. "The White-eyed is a singer of astonishing spirit, and his sudden changes from one theme to another are sometimes almost startling. He is a skillful ventriloquist also, and I remember one in particular who outwitted me completely. He was rehearsing a well-known strain, but at the end there came up from the bushes underneath a querulous call. At first, I took it for granted that some other bird was in the underbrush, but the note was repeated too many times, and came in too exactly on the beat."

Several of the sparrows modulate their notes so as to greatly deceive in regard to distance. In riding along country roads how often one looks away into fields to see the vesper sparrow (*Poœcetes gramineus*), when it is singing from its perch close by, on a fence stake. The song of the field sparrow (*Spizella pusilla*) is still more deceiving. One is also often puzzled to locate the notes of the Baltimore oriole (*Icteria Baltimore*). Both sexes have, to a certain extent, this power to mislead, and what is still more curious, the young birds will often perplex one in regard to their whereabouts.

Few birds with soft voices can project their notes farther than can the cuckoos, but often in the near presence of man there is

such a 'remoteness' about their mellow "coo, coo," that only the trained ear of an ornithologist can readily locate the bird. Burroughs speaks of their "clairvoyant call," and Wordsworth, without giving it a name, recognized this quality when he sings of the Cuckoo :

> "While I am lying on the grass,
> Thy loud note smites my ear;
> From hill to hill it seems to pass :
> At once far off and near."

Lowell, in his charming sketch "My Garden Acquaintance," notices this habit of the robins : "When they come after my cherries to the tree near my window, they always muffle their voices, and their faint peep sounds far away at the bottom of the garden. The screech owl also softens its voice in the same way, with the most beguiling mockery of distance."

Most birds have themes or songs peculiar to their own species, and when we have learned these we recognize them whenever we hear them. Not so, however, of all. Even the common little goldfinch (*Chrysomitris tristis*) will often utter a strain so new and strange that those most familiar with it fail for a moment to recognize the author. The purple finch (*Carpodacus purpurens*) is also a variable singer. Some of his songs are as soft and peaceful as those of the warbling vireo; others wild and sylvan as those of the wood-thrush or winter wren, while still others are loud, sharp, and harsh, with as little melody as the song of the indigo bird. Their songs in different localities also differ so greatly that to the uninitiated they may easily be mistaken for those of other species. I remember a remarkable performance of one of these finches. While gathering rhododendrons in a wet woods near Angola, I was surprised at a strange song that broke the stillness of the quiet afternoon. It was low, sweet, tremulous, running up and down in such quavers of pure melody that for the moment I was sure that I was listening to an unknown singer of rare power, and not until I saw the bird could I believe that it was the familiar purple finch. The young birds had but recently flown from the nest, and two or three of them,

with the old birds, were at times in the same tree. The female was quite busy going and coming with food for the young, while the male continued for a long time singing his incomparably sweet songs, stopping only occasionally to caress one of the little birds as he passed from one to the other. It was a question whether this extra music was indulged in for the especial pleasure of his little family, or whether it was the every-day song of this particular finch.

In describing the birds of the Catskills, Eugene Bicknell says of the purple finches: "They appeared to be in full voice, but their songs were so different from that of the same species near New York City that I doubted their identity, till a specimen was secured. Not only the notes, but the manner of delivering them was entirely strange. In the lower Hudson Valley the song of this finch is rich and voluble, with the notes of definite character and number. In the Catskills all the notes were weak and inexpressive, and the song brief and of uncertain character."

The songs of some bobolinks are remarkable performances, both in tone and execution. The music of others is like that from instruments cracked and out of tune. Wilson Flagg says: "The songs of the song sparrow (*Melospiza melodia*), in the wilds of Northern New England, are more plaintive and sylvan, though not so loud and theme-like, as in thickly settled localities."

The power of imitation is possessed by a much larger number of birds than that of ventriloquism. Some individuals will master the entire song of another species. Bobolinks, when caged, have been known to appropriate the song of canaries and sing them for months, in preference to their own. Other birds will only acquire certain notes or bars, which they sometimes incorporate in their own songs, thus making quaint and curious medleys of doubtful quality. Canaries long living in company where they continually hear one another's notes will finally sing very nearly alike, though at first the general characteristics of their songs may have been quite different.

The mocking-birds excepted, perhaps the song sparrow (*Melospiza melodia*), oftener than others, mix with their strains notes

not belonging to their own songs. I have heard them throw in those of the chewink, both at the middle and ending of their songs; also that of the robin, blue bird, phebe bird, and purple finch.

Near a creek which is much frequented by water birds, I have heard during the past three summers a sparrow interject in his otherwise fine song the high, sharp notes of the peetweet. Dr. Placzek, in the *Popular Science Monthly*, speaks of a yellow thrush taken from the nest and domesticated, which, of its own accord, commenced crowing like a cock. "I sometimes heard, early in the morning, a clear, melodious cock crowing that seemed to come from a distant barn-yard. Going into the library one morning, where the bird was, I sat still in a further corner of the room till things began to get lively in the cage. I could see him without being seen. Soon he found his voice, and sounded the cock crow which I had so often heard before without suspecting its real origin. Had I not seen the bird's mouth open and his throat vibrating, I should still have thought the same came from a distance. When he saw me he broke off in the middle of the crowing. There is nothing particularly remarkable in the crowing of itself, for many birds imitate the sounds made by other animals. The curious fact about it was, that the bird would not crow in my presence, and would always stop when any one appeared to witness the execution. I attributed his conduct to a feeling of shame, or to a sense of unfitness of that method of expression. Have we not in this another proof of the possession of animals of a psychical quality which it has been used to regard as peculiarly and distinctively human?"

The blue-jay has considerable power of imitation, and frequently indulges in mimicry. One kept by a family whom I was visiting, would say "whoa" to the horse, sufficiently plain to stop the animal. If the bird was by the window, in sight of the gate, he was sure to call out "whoa" whenever the family horse was driven to the door. The jay never uttered the word to any horse except that of his master.

In its wild state I have never heard a bobolink make a hissing noise, yet a tame one which we had in our possession, when dis-

turbed or displeased, would hiss almost exactly like a goose. If a canary alighted on his cage, the bobolink would thrust out his head toward the intruder and hiss it off. Once, in a field, I heard a bobolink sing half the most common song of the American goldfinch. Last summer I used often to walk across Portage High Bridge to the Letchworth woods, to listen to a remarkably fine-voiced wood-thrush, that in every song interjected the long plaintive call of the wood-pewee. The effect was unique and surprising.

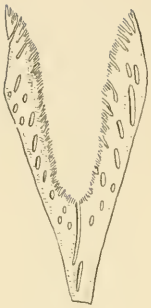
To those interested in the psychical or reason development of birds, this subject possesses increased interest. It is quite generally conceded that birds are not only the most interesting, but in some respects the most highly organized, especially in form, color, voice, and power of locomotion, of any of the so-called lower animals. In some directions, too, they are the most intelligent. Not only does their heredity count for much, but their experience is a large factor in shaping and modifying their manner of life. Many of them are quick to take advantage of any extraneous circumstances by which their conditions may be bettered. How many cases come under our notice in which cause and effect plainly enter into their calculation. Several species throw out sentinels to guard against surprise, and these have signal notes well understood by all. They learn to avoid localities that are extra dangerous, and often gather in large numbers where safety is assured. They profit both by experience and example, often modifying their nesting habits, and adopting new methods for protection. What subterfuges our native birds make use of to mislead and baffle larger birds of prey. On the contrary, the English sparrows, mostly denizens of villages and cities, and not often having been exposed to the dangers that beset the birds of forests and fields, fall an easy prey to the smaller hawks, owls and shrikes that occasionally find their way among them. They know well enough how to avoid the dangers of city life, and are seldom caught napping by cat or boy.

As the birds and their eggs are so preyed upon by such a multiplicity of enemies, perpetuation and self-defense become

the main problem of their lives. We all know how the female bird, when flushed from the nest, will flutter away, hobbling as though disabled and an easy prey until the pursuer is at a reasonable distance from the nest, when she will suddenly take wing and fly away to a safe retreat. It is easy to see what valuable services both mimicry and ventriloquism might be to them in avoiding and misleading their enemies, and it is not unreasonable to believe that in future ages these habits may become so general as to constitute a prominent feature in the bird's method of protection.

1*c*

×4



1*b*

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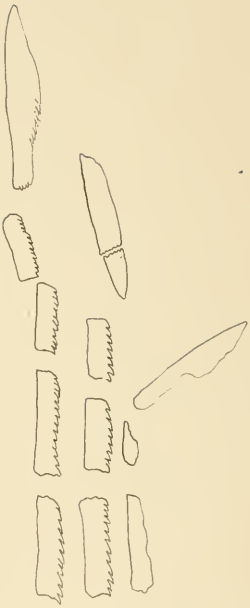
1*d*



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NOTES ON THE FOSSIL FISHES OF THE GENESEE AND PORTAGE BLACK SHALES.

BY HERBERT UPHAM WILLIAMS.

I propose giving here a short account of the fossil remains of fishes found in the Genesee and Portage black shales or their equivalents, with a few original observations. These shales are exposed at a number of places near Buffalo, but are best shown along the shore of Lake Erie for a few miles south of Eighteen Mile Creek. They usually have a slaty cleavage. They contain a very large amount of bituminous matter, and are somewhat like cannel coal in appearance. Nodules of iron pyrites are often seen. Septaria frequently occur, sometimes of very large size. Among the fossil remains are Crinoids, Brachiopods, Gasteropods, and other Mollusks, and large numbers of land plants.

The equivalent of these strata in Ohio is known by Dr. Newberry as the Huron shale, from which a number of fishes have been collected. Mr. F. H. Bradley found remains of a species of *Palaeoniscus* in Kentucky, in that formation. From the same group in Ohio, Newberry has described specimens of the following genera: *Dinichthys*, *Aspidichthys*, *Cladodus*, and *Ctenacanthus*. The first of these was a gigantic and very remarkable Placoderm. Mr. E. N. S. Ringueberg, in the American Journal of Science for June, 1884, gave an account of a very small species of *Dinichthys*, of which a dorsal shield was found in the Portage rocks of Sturgeon Point. This is, I believe, all that is definitely known of the fish remains of the Genesee and Portage shales, or their equivalents.

A careful observer cannot fail to notice scales and bones of fishes scattered over the slabs of slaty shale, often associated with land plants. I have collected a number of such specimens.

Among these the genus *Palaeoniscus* is represented by small, black rhomboidal scales, and fragments of bone, which belong to two different species. These species I have named *Palaeoniscus reticulatus*, and *Palaeoniscus antiquus*. Besides these there are other scales, belonging to at least three different genera, but so far not determined. I have also two plates, which plainly are part of the armor of some Placoderm. In their surface markings they resemble Mr. Ringueberg's figure of *Dinichthys minor*, but their outlines are too indistinct to determine to what part of the body they might have belonged. It is to be hoped that further investigation may throw more light on these interesting fossils.

There are also certain remains of a doubtful character which must at least be mentioned. These are what are known as Conodonts. They are nearly microscopic, tooth-like bodies, which have been found in strata ranging from the lower Silurian to the Carboniferous, both in Europe and America. They are considered by some authorities as spines of Mollusks, by others as belonging to Crustaceans, and by others still as the jaws of low varieties of fishes. This last opinion has a particular interest on account of the vast antiquity such a supposition would involve for the Silurian specimens. One of the most fruitful localities in America for Conodonts has been the exposure of the Hamilton and Genesee shales on Lake Erie, south of Eighteen Mile Creek. Descriptions and figures of a large number of forms from this place are given in the Quarterly Journal of the London Geological Society for 1879, by Dr. Hinde. I have found similar specimens in the Portage group as well, at Sturgeon Point and elsewhere. They are plainly visible under a low magnifying power, being white and nearly translucent. They consist of single teeth, or rows of teeth, upon a base, with which they are coalescent, and sometimes they are not unlike a comb in appearance.

Below are given descriptions of the two species of *Palaeoniscus* before mentioned. The work which the description of these specimens has involved, I have performed while studying in the

Palaeontological Laboratory of the University of Michigan, under the direction of Prof. Alexander Winchell, to whom I am indebted for much valuable assistance. I also wish to express my obligation to Prof. D. S. Kellicott, of Buffalo, for the use of specimens from his collection.

GENUS PALAEONISCUS. DeBlainville.

PALAEONISCUS RETICULATUS. (N. sp.) Fig. 1, a. e.

Bones of the head beautifully ornamented with prominent raised lines which are nearly parallel, or reticulated (Fig. I, d.) A fragment of bone has been found with ornamentation much like the above, which seems to be one ramus of a mandible. It is lanceolate in form, slightly curved, nearly one and one-fourth inches long. It bears a few small conical teeth at each extremity, with stumps of teeth near the middle. The surface is marked by parallel lines, and shows traces of reticulation. The scales are mostly rhomboidal, contiguous sides about one-twelfth inch in length. They are crossed by ridges parallel to the upper edge, which are pointed behind, forming serratures of the posterior margin, and which anteriorly are many times multiplied in number, making spine-like serratures on the anterior margin. These ridges interconnect or anastomose, giving thus a reticulated surface (Fig. I, a.) Some scales are oval or nearly circular in form, larger than the rhomboidal, but ornamented by similar ridges (Fig. I, c.) Other structures have been found which seem to be the scales placed over some portion of the dorsal line. They are V-shaped plates about one-fourth inch long. The surface of these is black and shining, ornamented by pits, or, along the inner edges of the two branches, by pit-like indentations or grooves, which are deepest and most numerous anteriorly. These grooves separate ridges, which are directed obliquely forward from the middle line of each branch, and which increase in number by implantation as they approach the edge, forming spine-like serratures upon the inner margin (Fig. I, b.) The fin-rays are represented by minute, oblong, flat bones, serrated on one

edge, from one-fortieth to nearly one-tenth inch long, which are arranged in series. The series are often terminated by pointed bones (Fig. I, e.)

Locality.—Black shale of Portage group, Sturgeon Point, Erie County, N. Y.

PALAEONISCUS ANTIQUUS. (N. sp.) Fig. 11, a. d.

Scales usually rhomboidal, contiguous sides about one-tenth inch each, posterior margin serrated, serratures three to ten in number, serrature nearest upper margin often larger than the others (Fig. II, b.) The middle of the upper margin bears a short triangular process for articulating the scales together. The surfaces are black, polished, and nearly smooth, ornamented only by two fine lines about the anterior margin, and by a few punctures. Some scales are of an oval form, prolonged above into two diverging points (Fig. II, c.) No parts of this fish, except the scales, have yet been discovered.

Locality.—Black shale of Portage group, Sturgeon Point, Erie County, N. Y.

FISH REMAINS FROM THE CORNIFEROUS, NEAR BUFFALO.

BY FRED. K. MIXER AND HERBERT UPHAM WILLIAMS.

It was long supposed that remains of fishes were extremely rare in strata of the Corniferous period near Buffalo. The collection of the Society of Natural Sciences contains a single broken Ichthyodorulite. We have to report the finding of a considerable number of specimens that must certainly be parts of fishes, though they are not in a very perfect state of preservation. They are still undetermined, and some of them will probably prove to be new species. Among these fossils are spines of several forms, scales, plates, and pieces of bone. We hope to be able to identify them by the collection of more perfect ones of the same sort, and the results will be published in this BULLETIN.

NATIVE AND NATURALIZED PLANTS OF BUFFALO AND ITS VICINITY.

SECOND SUPPLEMENT.

DAVID F. DAY.

In February, 1884, the first SUPPLEMENT to our CATALOGUE of the Flora of Buffalo was issued. In the interval of time, which has since elapsed, further investigations of the Botany of our region have been made, with such results as warrant the publication of a second supplement at the present time.

We here record, with great pleasure, the success which has crowned the efforts, made in such investigations, by the zealous young botanists of the *Buffalo Naturalists' Field Club*. Their enthusiasm and devotion give promise that, when they have extended their explorations into the newer and less frequented portions of our territory, very little indeed of its floral wealth will remain unknown. It is, however, to be hoped that very soon among their number, one or more may appear, whose taste for botanical research will find its gratification in the too much neglected families of the CRYPTOGAMÆ. Our *Musci*, *Hepaticæ*, *Fungi* and *Algæ* should afford to them an abundant and most delightful field for study and investigation.

It is with great regret that the fact is here stated that, with the exception of three species of Ferns and eleven Lichens, no native Cryptogamous plant has been added to our list.

During the earlier years of the Society, it was known to us that the botanists of the neighboring portions of Canada were not idle. But, at the time when our Catalogue was prepared, it was impossible for us to avail ourselves, in any way, of their labors Nor, indeed, did we have any definite idea of how much they had accomplished, until the publication began of that important contribution to the literature of American Botany—Professor JOHN MACOUN'S "CATALOGUE OF CANADIAN PLANTS." As yet, only two parts of that most excellent work have reached us; but we have been able, by its aid, to add largely to the list

of plants growing within our neighborhood, west of Niagara River. In our citations from Professor MACOUN's work, we have not, it is true, confined ourselves to plants growing within a radius of fifty miles from Buffalo—the limit chosen for the purposes of our Catalogue—but we have brought into the list a considerable number of species, which Mr. WILLIAM SAUNDERS (a Corresponding Member of the Buffalo Society of Natural Sciences), and T. I. W BURGESS, M. B, of London, Ontario, have detected growing in the vicinity of that place. But it must be a satisfactory excuse, for departing from our own prescribed rule, that we thus point out the fact to Buffalo botanists that a few hours' travel is sufficient to bring them into a region presenting so large a number of plants of a distinctly western character.

It will be observed, no doubt with some surprise, that even of the small but interesting family of Ferns, our Canadian friends have made Foster's Flats, the "Yo Semite" of Niagara River, to yield to them two rare species, whose existence, in that much frequented resort of the botanists of our city, had remained by them unknown and unsuspected.

The name of no plant is presented in this Supplement, whose growth in the locality mentioned in connection with it, is to us a matter of doubt. Yet the fact should be understood that we desire to be held responsible only for those species of which we have seen specimens. This will exclude the plants mentioned only on the authority of the Canadian botanists and of Mr. E. C. TOWNSEND.

The asterisk, prefixed to the name of any plant in the following list, indicates that such name is new to our catalogue. The other names in the list are given because of the locality being new, or because some other reason made mention of them necessary or proper.

This Supplement has increased the number of known genera of plants, growing within the distance of fifty miles from Buffalo, to 954, and that of the known species and varieties to 2895.

July 10, 1886.

ADDITIONS TO THE LIST OF BUFFALO PLANTS.

Ranunculus multifidus, Pursh.

Abundant at Caledonia, Livingston Co., May 2, 1886. *Buffalo Naturalists' Field Club.*

Ranunculus alismæfolius, Geyer.

Vicinity of Port Colborne, Ontario. *Macoun.* (Catalogue Canadian Plants.) But probably the plant will prove to be *R. ambigens.* Watson.

***Ranunculus rhomboideus**, Goldie.

Near London, Ontario. *Saunders.* (Cat. Can. Plants.)

RANUNCULUS REPENS, L.

The European plant appears in places in Buffalo where English "Lawn Grass Seed" has been sown. 1885.

RANUNCULUS BULBOSUS, L.

Vicinity of Hamilton, Ontario. *Buchan.* (Cat. Can. Plants.)

Asimina triloba, Dunal.

Several considerable patches of the Papaw have been pointed out to us, near Lockport, Niagara County, by Dr. *E. N. S. Ringueberg.* May 22, 1886. Rich, low woods below Queenston Heights, Ontario. *Macoun.* (Cat. Can. Plants.)

Cimicifuga racemosa, Nutt.

Abundant near Salamanca, Cattaraugus County. 1885.

Jeffersonia diphylla, Barton.

Near London, Ontario. *Saunders.* (Cat. Can. Plants.)

Sarracenia purpurea, L.

Several sphagnous swamps near Springville, Erie County, have afforded us new and abundant localities of the Pitcher Plant, June 13, 1885. *Buff. Nat. Field Club.*

***Nasturtium palustre**, L., var. **hispidum**, Fisch. & Meyer.

Neighborhood of London. *Burgess.* (Cat. Can. Plants.)

*BARBAREA VULGARIS, R. Br., var. STRICTA, Regel. (*B. praecox*, R. Br.)

Queenston Heights, Ontario. *Macoun.* (Cat. Can. Plants.)

*LEPIDIUM RUDERALE, L.

Roadsides, Hamilton, Ontario. *Buchan.* (Cat. Can. Plants.)

LEPIDIUM CAMPESTRE, R. Br.

Becoming abundant along Humboldt Parkway, Buffalo. At Clifton, Ontario. *Macoun.* Hamilton, Ontario. *Buchan.* (Cat. Can. Plants.)

ALYSSUM CALYCINUM, L.

Now plentiful along Humboldt Parkway, near Main Street, Buffalo, and elsewhere in that neighborhood.

Viola Selkirkii, Pursh.

Woodstock, Ontario. *Burgess.* (Cat. Can. Plants.)

Viola striata, Ait.

Common near Hamilton, Ontario. *Logie.* (Cat. Can. Plants.)

Viola sagittata, Ait.

Vicinity of London, Ontario. *Burgess.* (Cat. Can. Plants.)

***Hudsonia tomentosa**, Nutt.

Port Colborne, Ontario. (Cat. Can. Plants.)

Drosera rotundifolia, L.

In the sphagnous swamps, near Springville, Erie County. 1885. *Buff. Nat. Field Club.*

Silene stellata, Ait.

"Dry, stony places on the Niagara River. *Douglass.* 1823. Not detected lately." (Cat. Can. Plants.)

***Arenaria Michauxii**, Hook. (*A. stricta*, Michx.)

Near London, Ontario. *Saunders.* (Cat. Can. Plants.)

Cerastium arvense, L.

Observed occasionally on "The Plains," Buffalo.

*SCLERANTHUS ANNUUS, L.

Port Colborne, Ontario. (Cat. Can. Plants.)

***Malva crispa**, L.

Naturalized near Fort Erie, Ontario. 1885.

Linum Virginianum.

Vicinity of Hamilton, Ontario. *Logie.* Near Niagara Falls, Ontario. *Macoun.* (Cat. Can. Plants.)

*GERANIUM PRÆTENSE, L.

Spontaneous in a garden, Buffalo, and likely to continue.

*ERODIUM CICUTARIUM, L'Her.

Vicinity of Hamilton, Ontario. *Buchan.* And of London, Ontario. *Burgess.* (Cat. Can. Plants.)

Rhus glabra, L.

Queenston Heights, Ontario. *Macoun.* (Cat. Can. Plants.)

Vitis Labrusca, L.

Vicinity of Hamilton, Ontario. *Buchan.* (Cat. Can. Plants.) Native here or introduced?

Polygala incarnata, L.

"Rocky places on the Niagara River, near the Falls. *Douglass*, 1823. Not seen by later collectors." (Cat. Can. Plants.)

***Polygala Sanguinea,** L.

Near Lancaster, Erie County. *E. P. Van Duzee*, 1883. Eighteen Mile Creek, Erie County. Prof. *D. S. Kellicott.* Near Strykersville, Wyoming County. Miss *Mary S. Heath*, 1885. Vicinity of Hamilton. *Logie* and *Buchan.* (Cat. Can. Plants.)

***Polygala polygama.** Walt.

Vicinity of London, Ontario. *Burgess.* (Cat. Can. Plants.)

Trifolium hybridum, L.

Becoming frequent in Buffalo. Abundant at Machias, Cattaraugus County. 1885.

***Desmodium pauciflorum,** D. C.

Woods at Niagara Falls. *Macoun.* Vicinity of Hamilton, Ontario. *Logie.* (Cat. Can. Plants.)

***Desmodium ciliare.** D. C.

Dry, sandy thickets, Queenston Heights, Ontario, 1877. *Macoun.* (Cat. Can. Plants.)

***Lespedeza repens.** Barton.

The Dell, Ancaster, near Hamilton, Ontario. *Logie.* But, according to Macoun, probably *L. reticulata* Pers. (Cat. Can. Plants.)

***Vicia hirsuta.** Koch.

Vicinity of Hamilton, Ontario. *Buchan.* (Cat. Can. Plants.)

Phaseolus diversifolius. Pers.

Observed, September, 1882, by Mr. *John F. Cowell*, near the ruins of old Fort Erie, Ontario. Since found in great abundance along the beach of the lake, for a mile or two, immediately above the Fort. It may be stated, with the utmost confidence, that the plant could not have occurred, in any considerable quantity, in the locality named, twenty years ago. It is unquestionably a new comer; yet probably introduced by natural causes.

Baptisia tinctoria, R. Br.

Vicinity of Hamilton, Ontario. *Logie.* (Cat. Can. Plants.)

*Prunus spinosa, L.

Reported as occurring in Niagara County, by Prof. *A. B. Evans*, upon the authority of Mr. *Edward C. Townsend.*

*Prunus Mahaleb, L.

One specimen, in flower, seen by us near Lockport, Niagara County, May 22, 1886. Spontaneous.

Gillenia trifoliata, Mœnch.

Prince's Island near Hamilton, Ontario. *Logie* (Cat. Can. Plants)

***Geum triflorum**, Pursh.

Vicinity of London, Ontario. *Burgess.* (Cat. Can. Plants.)

***Potentilla pilosa**, Wald.

"On the bank of the Canada Southern Railway, a little above the Clifton House, Niagara Falls." *Macoun.* (Cat. Can. Plants.) This is the plant called by us *P. recta*, L., in the supplement to "The Plants of Buffalo and Vicinity," but not the one mentioned in the body of the Catalogue. It is not unlikely, however, that the two plants are forms of one species.

Potentilla palustris, Scop.

Abundant at Black Creek, Ontario, June 7, 1885. *Buff. Nat. Field Club.*

Pyrus arbutifolia, L.

With double flowers, near Springville, Erie County, June 5, 1886. *Buff. Nat. Field Club.*

***Ribes rotundifolium**, Michx.

Collected by Miss *Belle M. Ross*, near Batavia, Genesee County. Probably not rare, but overlooked.

***Philadelphus inodorus**, L., var. grandiflorus. Gray.

Reported as occurring in Niagara County, by Prof. *A. B. Evans*, upon the authority of Mr. *Edward C. Townsend.* Probably introduced. Frequently spontaneous in gardens in Buffalo.

***Sedum ternatum**, Michx.

Rocks on the Niagara River and Lake Erie. *Douglass*, 1823? Vicinity of Hamilton, Ontario. *Buchan.* (Cat. Can. Plants.)

***Epilobium hirsutum**, L.

Introduced at Clifton, Ontario, 1883.

*Œnothera chrysantha, Michx.

Chippewa, Ontario. *Madagan.* Queenston Heights, and Niagara Falls, Ontario. *Macoun.* (Cat. Can. Plants.)

Œnothera pumila, L.

Vicinity of Hamilton, Ontario. *Logie.* (Cat. Can. Plants.)

*Archemora rigida, DC.

Port Colborne, Ontario. (Cat. Can. Plants.) Found by us at the place mentioned many years ago, but omitted from our catalogue by inadvertence.

Erigenia bulbosa, Nutt.

Rich woods around London, Ontario. *Burgess.* (Cat. Can. Plants.)

*Cornus asperifolia, Michx.

Prof. *Macoun*, ventures the opinion that this plant is common along the shore of Lake Erie. It occurs at Point Pelee, Ontario. (Cat. Can. Plants.)

*Galium verum, L.

Introduced at Buffalo, but not abundant. Vicinity of Hamilton, Ontario. *Buchan.* (Cat. Can. Plants.)

*Valeriana edulis, Nutt.

Near London, Ontario. *Burgess.* (Cat. Can. Plants.)

Fedia olitoria, Vahl.

Naturalized near Lockport, Niagara County. 1886.

Aster undulatus, L.

Vicinity of Hamilton, Ontario. *Logie.* (Cat. Can. Plants.)

Solidago arguta, Ait. (Typical form.)

Vicinity of Hamilton, Ontario. *Logie.* St. Catharines and Chippewa, Ontario. *Maclagan.* London, Ontario. *Burgess.* (Cat. Can. Plants.)

*Solidago odora, Ait.

Near Hamilton, Ontario. *Logie.* (Cat. Can. Plants.) But Prof. *Macoun* doubts the identification.

*Silphium terebinthinaceum, L.

Along the Great Western Railway, east of Paris, Ontario. *Prescott.* (Cat. Can. Plants.)

Xanthium spinosum, L.

Abundant at Dundas, Ontario. *Burgess.* (Cat. Can. Plants.)

*Helianthus giganteus, L.

Vicinity of Hamilton, Ontario. *Logie.* Common at London, Ontario. *Burgess.* Port Colborne, Ontario. (Cat. Can. Plants.) Spontaneous in a garden in Buffalo.

*Coreopsis tripteris, L.

Spontaneous in a garden in Buffalo.

*Matricaria discoidea, DC.

Thoroughly established along a roadside near Lockport, Niagara County. An emigrant from the "Far West." 1884. Dr. *E. N. Ringueberg.*

*Tragopogen porrifolius, L

Vicinity of London, Ontario. *Burgess.* (Cat. Can. Plants.)

*Hieracium pilosella, L.

Vicinity of London, Ontario. *Burgess.* (Cat. Can. Plants.)

*Hieracium longipilum, Torr.

Vicinity of Hamilton, Ontario. *Logie.* (Cat. Can. Plants.)

*Hieracium auranticum, Hook.

Spontaneous in gardens, Buffalo, and escaping.

*Lobelia spicata Lam.

London, Ontario. *Saunders.* (Cat. Can. Plants.)

Vaccineum stamineum, L.

Whirlpool woods, below Niagara Falls. *Maclagan.* (Cat Can. Plants) Alden, Erie County, May 30 1885. *Buff. Nat. Field Club.*

Pyrola rotundifolia, L.

Plentiful at Indian Falls, Genesee County, June 20, 1885. *Buff. Nat. Field Club.*

Moneses uniflora, Gray.

Abundant at Indian Falls, Genesee County, June 20, 1885. *Buff. Nat. Field Club.*

Lysimachia lanceolata, Walt

This species, which should have been marked as rare in our catalogue of the plants of Buffalo, has been noticed at Point Abino, Ontario. It is also attributed to the vicinity of London. *Burgess.* (Cat. Can Plants)

Utricularia intermedia, Hayne.

Vicinity of Hamilton, Ontario. *Buchan.* And of London, Ontario *Burgess.* (Cat. Can. Plants.)

VERBASCUM BLATTARIA, L.

The variety with yellow flowers abundant at Portage, Genesee Co. Mr. *John Chamberlain.*

*Pentstemon lævigatus, Solander. (*P. Digitalis*, Nutt.)

Evans, Erie County, June, 1884, Mr. *Emil Chamot.* Angola, Erie County, June 19, 1886, Miss *Mary A. Fleming.* Spontaneous in a garden in Buffalo. Reported as occurring in Niagara County, by Prof. *A. B. Evans*, upon the authority of Mr. *Edward C. Townsend.*

*VERONICA BUXBAUMII, Tenore.

Reported as occurring in Niagara County, by Prof. *A. B. Evans*, on the authority of Mr. *Edward C. Townsend.*

Gerardia pedicularia, L

Sandy woods near Clifton, Niagara Falls. *Macoun.* (Cat. Can. Plants.)

Verbena augustifolia, Michx.

Port Colborne, Ontario. (Cat. Can. Plants)

*Isanthus cæruleus, Michx.

Westminster, near London, Ontario. Miss *Crooks.* (Cat. Can. Plants,)

Pycnanthemum incanum, Michx.

Vicinity of Hamilton, Ontario. *Logie.* (Cat. Can. Plants.) Prof. Macoun intimates a doubt of the identification of the plant.

Lophanthus scrophulariæfolius, Bentham.

Slopes of Queenston Heights. *Macoun.* (Cat Can. Plants.)

*Cedronella cordata, Benth.

Reported as occurring in Niagara County, by Prof. *A. B. Evans*, on the authority of Mr. *Edward C. Townsend.*

*Lamium album, L.

At Hamilton, Ontario. *Buchan.* (Cat. Can. Plants.)

*Lithospermum canescens, Lehm.

Sandy soil near London, Ontario. *Burgess.* (Cat. Can. Plants.)

*Onosmodium Virginianum, DC.

Vicinity of London, Ontario. *Burgess.* (Cat. Can. Plants.)

*SYMPHYTUM ASPERRIMUM, L.

Established near the Parade, Buffalo.

*Hydrophyllum appendiculatum, Michx.

Around London, Ontario. *Burgess* and *Saunders*. (Cat. Can. Plants.)

*Polemonium cæruleum, L.

Discovered at Portage, Livingston County, 1886. Mr. *John F. Cowell.*

Phlox paniculata, L.

Abundant and native in one locality near Salamanca, Cattaraugus County. 1885.

Convolvulus spithamæus, L.

Common on gravelly soil in the vicinity of London, Ontario. *Saunders* and *Burgess*. (Cat. Can. Plants.)

*Solanum rostratum, Dunal.

Cattle yards at East Buffalo, 1883. Waste places near the foot of York street, Buffalo, 1885. Mr. *John Chamberlain.*

Solanum Carolinense, L.

Cattle yards at East Buffalo, 1883. Still continuing near Fort Erie, Ontario, 1885.

*Physalis Virginiana, Mill.

Common at Niagara Falls. *Macoun.* Vicinity of Hamilton, Ontario. *Logie.* And of London, Ontario. *Burgess.* (Cat. Can. Plants.)

*Halenia deflexa, Grisel.

Vicinity of Hamilton, Ontario. *Logie.* And of London, Ontario. *Burgess.* (Cat. Can. Plants.)

Asarum Canadense, L.

Under this name two species seem to us united. Both belong to our region. One plant, the more common here, is much more robust than the other. Leaves *larger* and *cordate.* Flowers *nearly twice as large*, with awl-shaped *appendages in the sinuses of the calyx*. Blossoming *three weeks earlier* than the other.

The smaller plant has *reniform* leaves, considerably less in size. Flowers usually wanting the appendages. We have seen both plants in cultivation, side by side, for several years, and the differences have proved constant.

*Aristolochia Sipho, L'Her.

Reported as occurring in Niagara County, by Prof. *A. B. Evans*, on the authority of Mr. *Edward C. Townsend.*

Amaranthus ————.

The undetermined species, mentioned in the Supplement to our Catalogue, was observed by us growing near Denver, Colorado, in 1883, and with it *A. blitoides*, Watson.

***Celtis occidentalis**, Towne.

Small trees, probably of this species, were pointed out to me near Lockport, Niagara County, by Dr. *E. N. S. Ringueberg.* (May 22, 1886). It was stated that they had never been observed in flower or fruit. The leaves, which were immature, seemed to approach those of *C. Mississippiensis*, Bosc. Possibly the specimens may prove of that species.

Morus rubra, L.

On the same day (May 22, 1886), Dr. *Ringueberg* called my attention to a specimen of the Red Mulberry, growing very near his *Celtis*.

Comptonia asplenifolia, Solander.

Indian Falls, Genesee County, June 20, 1885. *Buff. Nat. Field Club.*

Epipactis Helleborine, var. **viridens**, Irm.

Another station in the city of Buffalo has been discovered by Mrs. *Mary B. Mooby.*

Corallorrhiza innata, R. Br.

Machias, Cattaraugus County, May 19, 1886. *Buff. Nat. Field Club.*

Cypripedium acanle, Ait.

Abundant near Springville, Erie County. *Buff. Nat. Field Club.*

Sisyrinchium Bermudiana, L., var. **albidum**, Gray.

In crevices of the rocks on the shore of Lake Erie, at Point Abino. 1883.

Chamælirium luteum, Gray.

Plentiful at Angola, Erie County, June 19, 1886. *Buff. Nat. Field Club.*

Smilacina trifolia, Desf.

Sphagnous swamps near Springville, Erie County, and at Alden, Erie County. *Buff. Nat. Field Club.*

Erythronium albidum, Nutt.

Abundant at Eighteen Mile Creek, Erie County, May 16, 1885. *Buff. Nat. Field Club.*

*Pellæa gracilis, Hook.

Crevices of rocks, Foster's Flats, Niagara River. *Macoun.* (Canadian Filicineæ.)

*Aspidium Boottii, Tuckerman.

Vicinity of Hamilton, Ontario. *Logie.* (Canadian Filicineæ.)

Camptosorus rhyzophyllus, Link.

At Lockport, but scarce. May 22, 1886. Abundant at Indian Falls, Genesee County. *Buff. Nat. Field Club.*

*Aspidium Lonchitis, Swartz.

Found sparingly at Foster's Flats, Niagara River. *Macoun.* (Canadian Filicineæ.)

*Physcia adglutinata, (Flk.) Nyl.

Miss *Mary L. Wilson.*

*Sticta quercizans, (Michx.) Ach.

Portage, Genesee County. Miss *Wilson.*

*Pertusaria multipunctata, (Turn.) Nyl.

Miss *Wilson.*

*Cladonia delicata, (Erhr.) Fl.

Miss *Wilson.*

*Cladonia pulchella, Schwein.

Miss *Wilson.*

*Biatora decipiens, Fr.

Niagara Falls. Miss *Wilson.*

*Lecidea plaustica, Tuckerman.

Miss *Wilson.*

*Buellia Schæreri, (DeNot.) Mass.

Miss *Wilson.*

*Buellia petræa, (Flot.) Tuckerman.

Miss *Wilson.*

*Calicium subtile, Fr.

Miss *Wilson.*

*Calicium albo-nigrum, Nyl.

Miss *Wilson.*

Marsilea quadrifolia, L.

Introduced near Lewiston, Niagara Co., and at other places.

THE THICKNESS OF THE ONONDAGA SALT GROUP AT BUFFALO, N. Y.

BY JULIUS POHLMAN, M. D.

A well drilled by the Buffalo Cement Co., at Buffalo Plains, affords interesting material for a study of the thickness of the Onondaga salt group, as well as of the sudden thinning out or remarkable dip of the Niagara limestone. As about 500 feet of this well were drilled by means of a diamond drill, and the cores carefully preserved, the record gives unquestionable data, and shows the development of the different formations in Erie Co. in the greatest perfection.

Beginning at a spot where the rocks of the waterlime group, suitable for the manufacture of cement, had been removed, and which is 70 feet above the level of Lake Erie, or 643 feet above tidewater, the drill encountered the following strata:

1—25 feet, shale and cement rock in thin streaks;
25—30 feet, tolerably pure cement rock;
30—43 feet, shale and cement rock in thin streaks;
43—47 feet, pure white gypsum;
47—49 feet, shale;
49—61 feet, white gypsum;
61—62 feet, shale;
62—66 feet, white gypsum;
66—73 feet, shale and gypsum, mottled;
73—131 feet, drab colored shale with several layers of white gypsum, measuring 18 feet in all;
131—133 feet, dark colored limestone;
133—137 feet, shale and limestone;
137—140 feet, dark colored compact shale;
140—720 feet, gypsum and shale, mottled and in streaks;
720—725 feet, limestone;

725—760 feet, soft red shale;

760—785 feet, white solid quartzose sandstone, very hard;

785—1305 feet, soft red shale.

At 1305 feet the drill was stopped. Permanent water was struck at 43 feet; gas, of fair quality as well as quantity, at 452 feet; salt water, leaving on evaporation about 12 per cent. of salt, was found at 555 feet. A shaft, 20 feet square, was sunk on the premises later, for the purpose of determining the feasibility of mining the gypsum, but the rush of water through the gypsum layer at 43-47 feet, was so strong that a pump with a capacity of 2000 gallons per minute failed to make any impression upon it, and the attempt was abandoned.

The average dip of the rocks from the north to the south, in this vicinity, is about 20 feet to the mile. The top of the Niagara limestone, ten miles north of Buffalo Plains, is about 20 feet above the level of Lake Erie, or 593 feet above tidewater; hence, as the drill started at 70 feet above the lake level, Niagara limestone ought to be found at a depth of about 250 feet; but in fact the drill penetrated down to 1305 feet in the soft red shale, characteristic of the lower part of the Onondaga Salt Group, according to Hall, demonstrating that the Niagara limestone, if present, has between Niagara Falls and Buffalo, a dip of at least 130 feet to the mile.

Mr. Bennett, the president of the Cement Co., has promised to deposit the core of the drill in the museum as soon as it is established in the fire-proof building of the Buffalo Library.

BULLETIN

OF THE

BUFFALO SOCIETY OF NATURAL SCIENCES.

VOLUME V. NO III.

The Mills Collection of Fresh-Water Sponges

DAVID S. KELLICOTT, Ph. D.

The fresh-water sponges in the collection of the lamented HENRY MILLS were placed in my hands many months ago with the understanding that a representative set of specimens would be selected and prepared for the Buffalo Society of Natural Sciences. After what may seem an unnecessarily long delay, I submit, at my earliest convenience, the specimens with a record of such date as I am able to gather. In as much as all the species as yet identified from the vicinity of Buffalo prove to be represented, I have added such facts as have come to my knowledge, concerning the discovery, occurrence and distribution of each species, thus making an annotated list of the fresh-water sponges thus far discovered in this neighborhood.

The region about Buffalo bay and the Niagara river afford almost ideal conditions for the life and growth of fresh-water animals. Its richness is even yet scarcely appreciated. The outlet of the American fresh-water ocean remains at almost a constant level. It is not like so many lesser American rivers, a mere thread of heated water in summer and a flood of tilt in winter and spring. Neither storm nor season greatly dis-

turbs its clearness or destroys its purity; and owing to its mass its temperature changes slowly and the range is moderate. There are also deep passages, once portions of the river-bed, now almost land locked, but still sufficiently open to the river to admit fresh water and maintain a constant level. Aquatic life in these channels is phenomenally luxuriant for a North American station in latitude 43°. Again there are small rivers or creeks entering the main river, the estuaries of which are deep, quiet, and supplied from above with swamp and land drainage, whilst their constancy is assured by that of the Niagara. These are teeming with a vast variety of microscopic plants and animals from early summer to December. These conditions are especially favorable to the growth of sponges and here they are found in remarkable abundance. Whilst the number of species recorded compares favorably with any explored locality in the world, the abundance of representatives is, according to my experience and the testimony of others, quite unsurpassed.

The specimens of this collection were obtained by Mr. Mills, by personal exploration of our own vicinity, and also in Iowa, Wisconsin, Florida and Ohio, and by exchange from other localities. They were preserved by drying. Every example has been re-examined to confirm determinations already made or to determine such as were not labeled. In most cases the following method proved rapid and satisfactory. A row of watch glasses, each with a few drops of carbolic acid, were placed on the work-table and a selected fragment of a sponge placed in each with proper numbering to prevent confusion. After a short interval examination could be commenced. This was done by transferring material to ordinary slides and examining in the acid. The statoblasts were soon sufficiently transparent to permit a determination of the structure by a one-fourth inch objective.

The following genera are represented: *Spongilla*, *Meyenia*, *Heteromeyenia*, *Tubella* and *Carterius*. All are represented by one or more species in Western New York. A brief key to the genera is here introduced to aid any intending students of local forms.

Key to Genera.

1. Statoblasts or gemmules surrounded by smooth or spined acerate or cylindrical spicules only. *Spongilla.*

2. Statoblast surrounded by equally birotulate spicules, all of *one* type, resting by one rotula on the chitinous coat. *Meyenia.*

3. Same with birotulates of *two* types, *i. e.*, at least shafts of unequal length. *Heteromeyenia.*

4. Same as *Meyenia* except the birotulates have unequal rotulæ, the larger resting on the chitinous coat. *Tubella.*

5. Same as preceeding genera except the foramen is a prolonged tube with its distal extremity expanded into a more or less funnel-like expansion bearing one or more cirrous appendages on its margin. *Carterius.*

SPONGILLA.

1. **S. lacustris,** Linn. Monograph*, p. 186.

This exceedingly variable and widely distributed species appear to be found but sparingly at Buffalo. It should be looked for in shallows along the Niagara and other streams, even where there is considerable flow. It also occurs in ponds and has the habit, unlike most species, of growing fully exposed to the sun's rays, upon suitable supports or even upon the bottom sending its long bristling fingers up into the passing water. In such situations it is usually green and easily overlooked among aquatic vegetation.

The specimens are as follows: 1. Mass of branches, 5′x3′x2′, green. Fox Lake, Wisconsin, Sept. 1886. Collector Henry Mills. 2. Similar branches, Fox River. Same date. 3. Specimen incrusting twigs, colorless. Bear Creek, Iowa Sept. 1883 Henry Mills.

There are also two varieties of *S. lacustris* represented, viz: *paupercula*, Bk. A small quantity from Cochituate Lake, Boston, and *mutica*, Potts, described from an ordinary example of *lacustris* in which the crust and gemmule spicules are wanting. From Edward Potts. Locality Philadelphia.

*Monograph Fresh-Water Sponges by Edward Potts, reprinted from *Proc. Phila. Acad. Nat. Sci.* 1887. This admirable treatise must necessarily afford the basis for all future work on American fresh water sponges.

2. **S. aspinosa,** Potts. *Monograph*, p. 184.

One specimen, locality Absecum Creek, N. Jersey.

3. **S. fragilis,** Leidy. *Monograph*, 197.

There are numerous characteristic specimens from different localities, as the species is every where in North America. I have not specially described each. It is very abundant about Buffalo. It may be of interest to note that it was the first North American sponge described (1851) and the second found in the Niagara, at least so far as the record of the local societies attest (October 1879). Certainly none awakened any greater interest and enthusiasm than the beautiful crusts of gemmules found on stones of the pier at Black Rock. Strangely enough this same form seems to have kindled the fire in the mind of Mr. Potts. In the Monograph p. 199 he says, "In 1878 or 1879 my attention was first attracted to the subject of fresh-water sponges by the discovery of a few gemmules, resembling a rust colored incrustation upon a stone from Lansdowne run, Philadelphia." A trivial circumstance surely, but one that led to researches that advanced science and soon demonstrated the wonderful richness of this type of life in America as compared with the scientifically explored parts of the old world.

Among the specimens of this species are several marked "compound form." They differ from the ordinary form which has a layer of close-set statoblasts or possibly seven successive layers, representing growth during as many years, the sarcode and spicules dropping away each fall. In this variety the gemmules occur in groups of two, three, four or more, bound together by a compact "cellular crust," often conspicuous; the foraminal tubes protrude slightly from the periphery. These masses are held loosely in the substance of the sponge, often surmounting a layer of ordinary forms cemented firmly to the support. Examples growing on weeds are wholly of the compound variety. Mr. Potts has made the reasonable suggestion that the normal type, cemented firmly to permanent supports, maintains the species from year to year in the same place; the other is dispersed on the breaking up of the sarcode, thus distributing the same.

MEYENIA.

1. **M. fluviatitis.** *Monograph*, p. 219.

This is one of a few species occurring in the greatest abundance about the Niagara and its tributaries. Those from the river generally agree very well with the type whilst those from ponds and streams show much variation. The variations consist in smooth or micro-spined spicules, thicker "crust" in the

gemmule, more numerous birotulates, longer or shorter shafts of birotulates etc. There are several forms marked "variety" but none has been found belonging strictly to the named varieties. The species grows on all sorts of supports but is found more frequently on aquatic plants in deep clear water than other forms.

2. **M. Millsii,** Potts, *Monograph*, p. 225.

Many small pieces collected by Mr. Mills in Sherwood Pond, DeLand, Fla. March, 1884. These fragments are same as those described, hence may be considered "type". It is an elegant species.

3. **M. Everetti,** Mills. *Monograph*, p 230.

Specimens, compacted masses, the long ropes or fibres of sponge found on plants. Collected by Francis Wolle, Gilder Pond, Mount Everett, September 1882. It is an extremely interesting species owing to the fact that it has birotulate dermal spicules.

4. **M. Leidyi,** Carter. *Monograph*, p. 212.

Several good specimens. Schuylkill River, Philadelphia.

5. **M. plumosa,** Carter, variety *Palmeri*, Potts. *Monograph* p. 234.

Two examples evidently from the describer of the species and hence of the type. Locality, Colorado river, Lerdo, Sonora, Mexico. This sponge was found on rocks and overhanging trees at a level that rendered it impossible that it should have been submerged more than a few months in the year.

6. **M. crateriformis,** Potts. *Monograph*, p. 228.

One specimen on bark, Niagara River. It was marked "variety," but on comparison I find no difference between it and that found at Columbus, O., which agrees well with the original description. I think the specimen is normal.

Pleiomeyenia was described by Mr. Mills in the *Proc. Am. Soc. of Mic.* VI—p. 147 as a new genus; the destinctive character was the arrangement of the birotulates in two or more series about the statoblast. Three species were described viz: *Calumeticus*, *Walkeri* and *spinifera*. The first two are in the Collection, both type specimens; the former from Calumet River, Ill., the second from Ischua Creek, Erie Co., N. Y. Other specialists have not admitted the validity of the genus and the species have been made synonyms of.

6. **M. Mülleri,** Lieberkühn. *Monograph* 224.

Specimens as above.

HETEROMEYENIA.

1. **H. Ryderi**, Potts. *Monograph*, p. 242.

   Specimens from St. Augustine, Fla., collected by Mr. Mills.

2. **H. repens**, Potts. *Monograph*, p. 237.

   Specimen on aquatic plant from shallow pond on border of Black Creek, Canada. Collected by the writer.

TUBELLA.

1. **T. Pennsylvanica**, Potts. *Monograph*, p. 251.

   Specimens from Delhi, O., Philadelphia, and other localities which are unknown. It proves to be a wide spread form. One large rust colored piece was taken from a water main, Philadelphia. It is interesting on account of its strange habitat.

CARTERIUS.

1. **C. tubisperma**, Mills. *Monograph*, p. 263.

   Numerous typical examples from the Niagara and from distant localities. Very abundant at Buffalo growing on rocks or piers, often on the bottom of shallow bays. This was the first species of sponge found at Buffalo. The writer's note book contains a drawing of a statoblast made the day of the "find" and dated October 11, 1879.

2. **C. latitenta**, Potts. *Monograph*, p. 264.

   Excellent specimens from Scajaquada Creek 1886. There is much variation in the distal expansion of the tube and in the fibres arising from the same.

3. **C. tenosperma**, Potts. *Monograph*, p. 265.

   Small example from Scajaquady Creek.

   It thus appears that all the species of the genus thus far found in America occur at Buffalo.

LIST OF THE MACRO-LEPIDOPTERA

Of Buffalo and Vicinity.

By Edward P. Van Duzee.

The list herewith submitted although confessedly far from complete includes all the species of Lepidoptera, exclusive of the Micros, known by our local collectors to have been captured in this city and its immediate vicinage. A radius of fifteen miles from Buffalo will include the localities from which nearly all the material here recorded has been derived. A few species, taken at a somewhat greater distance have been included to bring the range of the list into accord with that adopted by Mr. David F. Day in his List of Plants of Buffalo and Vicinity. All the localities mentioned in the present list appear on the map published in Vol. IV of this Bulletin to accompany Mr. Day's paper.

The Author's part in the preparation of this list has been merely that of compiler and co-contributor. Our local collectors have without exception exhibited their interest in the work by furnishing full lists of their captures with many valuable notes, and have very generously placed their entire collections at the Writer's disposal for study and comparison and by this means a number of synonymical errors have been avoided that might otherwise have seriously impaired the value of the list.

The collectors who have supplied the bulk of the material and to whom the value of the list is consequently due are as follows: Prof. David S. Kellicott, material taken in and about Buffalo; Mr. Alva H. Kilman, material taken at Ridgeway, Ont., a station near the shore of Lake Erie about thirteen miles west of Buffalo; Mr. Philip Fisher and Mr. J. P. Will, material captured largely at electric lights in this city or bred from larvæ taken in the surrounding towns; and the collections of the Author made mostly at Lancaster, about ten miles east of Buffalo. A few valuable notes have also been added by Mr. Wm. Mœser of this city. In addition to the above all accessible literature likely to contain notes on local forms has been carefully exam-

ined and all species accredited to localities within our limits have been included in the list with the proper references. This has proved no inconsiderable part of the compiler's task and has resulted in the addition of many interesting species largely from the labors of Mr. A. R. Grote.

Except in the case of the more common and widely distributed species the locality or localities of capture have invariably been given, followed by the surname or initials of the collector. The authority has also been affixed to all notes on the life-history or habits of the species, and wherever the occurrence here of a species has already been recorded in print the reference is appended if known to the Author.

When the publication of this list was first suggested it was the intention of Prof. Kellicott to undertake its compilation, but unfortunately his removal from our city rendered this inconvenient and the labor of its preparation necessarily devolved on another. Although losing in value by this change of authorship it is hoped that the list has suffered little in the mere quantitive enumeration of our species, thanks to the hearty co-operation of our local collectors. The list as here presented enumerates 773 species representing 336 genera, and includes all the Lepidoptera known to have been captured within our limits with the exception of the families Tortricidæ, Tineidæ, and Pterophoridæ, or the Micro-Lepidoptera, our collections of which are still too meagre to warrant their inclusion at the present time. It is hoped a list of these may be published later with such additions as may be made to the present list.

The Author takes pleasure in recording here a few personal acknowledgements; first of which is his indebtedness to Mr. A. R. Grote to whose kind attentions and personal instructions he owes such measure of success as he may have attained in his entomological studies, and to whom he also owes the determination of most of the material taken by him at Lancaster. He has likewise been placed under deep obligations to the following students of this order for assistance in the determination of material: Prof. J. A. Lintner, Prof. J. B. Smith, Rev. Geo. A. Hulst, and Prof. D. S. Kellicott. To these and to the local collectors before mentioned as well as to all who have assisted him with notes or specimens he wishes to express his sincere thanks,

In the arrangement of the species the following authorities have been taken as a guide: In the Rhopalocera Mr. Edwards' List of the Butterflies of N. Am.; in the Heterocera Prof. Grote's Check Lists of 1882 and 1890, with the exceptions of the Sphingids and Agrotids, where Prof. Smith's Monographs have been used, and of the Phycidæ where the arrangement of Mr. Hulst has been adopted.

ORDER LEPIDOPTERA.

Rhopalocera.

FAMILY PAPILIONIDÆ.

PAPILIO, Linn.

1. **P. Ajax,** Linn. *a*, Winter form *telamonides*, Feld.
   b, Summer form *marcellus*, Bd.
   This species is occasionally seen on the streets of Buffalo or at the park, and more rarely in the surrounding towns, Lancaster and Buffalo, E. P. V.; "Lockport, abundant ovipositing on the expanding leaves of paw-paw, May 1886," Kellicott; Ridgeway, Ont., Kilman; Sturgeon Pt. near Angola, Emil Chamot; Buffalo, Mœser, (see Can. Ent. XII p. 264.)

2. **P. Philenor,** Linn.
   Very scarce, Ridgeway, Ont., Kilman and Moffat, (Can. Ent. XII p. 264.)

3. **P. Asterias,** Fabr.

4. **P. Troilus,** Linn.
   Locally not uncommon, Lancaster, larvæ on spice bush, E. P. V.; "on lake shore near Angola," Emil Chamot; Ridgeway, Ont., Kilman.

5. **P. Turnus,** Linn.
   Common, especially on the wooded highlands south of Buffalo, Larvæ on lilac and *Populus monilifera*, E. P. V.; "Bred on ash," Kellicott.

6. **P. Cresphontes,** Cram.
   Occasional. First taken at Lancaster, Aug. 1882; one example has an expanse of 5 7/10 inches, E. P. V.; "Larvæ on *Xanthoxylum Americanum*", Kellicott. (See Bul. Buff. Soc. Nat. Sci., IV, p. 30.)

PIERIS, Schrank.

7. **P. Ilaire,** Godt.
   Accidental. Lancaster, one example taken Sept. 22, 1880. E. P. V. (Can. Ent. XXI p. 39.)

8. **P. Protodice,** Bd.-Lec.
   Formerly abundant, now rare if not extinct here. In 1878 this species abounded on the lake shore at the Tift farm and elsewhere. Larvæ on charlock.

9. **P. napi,** aberrent *virginiensis* Edwd.
   Ridgeway, Ont., one example, Kilman.

10. **P. napi.** Summer form *oleracea-æstiva* Harr.
    Formerly abundant and generally distributed, now apparently extinct here. Last seen at Lancaster about 1877.

11. **P. rapæ,** Linn.
    This imported pest has quite displaced the two preceding native species here as elsewhere. First taken at Lancaster in 1875.

12. **P. rapæ,** var. *nov-angliæ* Scudd.
    Buffalo, Fischer.

COLIAS, Fabr.

13. **C. Philodice,** Godt.
    Abundant everywhere; the albinic form rare. Larvæ on the garden pea.

TERIAS, Swains.

14. **T. lisa,** Bd.-Lec.
    Apparently accidental, One example taken by Mr. Fischer at Buffalo Plains, (Can. Ent. XVII p. 180.)

FAMILY NYMPHALIDÆ.

DANAIS, Latr.

15. **D. Archippus,** Fabr.

ARGYNNIS, Fabr.

16. **A. Cybele,** Fabr.

17. **A. Aphrodite,** Fabr.
    Less abundant than the preceding.

18. **A. Atlantis,** Edw.
    Rare. Buffalo, Fischer and Mœser.

A. Columbia.
"St. Catherines, Ont:", Saunders. (Can. Ent. XIV p. 151.) Probably this should have read *columbina* (=*Euptoieta claudia.*)

19. **A. Myrina,** Cram.
Open damp woods and swampy places, not common.

20. **A. Bellona,** Fabr.
Common everywhere in meadows.

EUPTOIETA, Doubld.

21. **E. Claudia,** Cram.
Rare. Lancaster, two examples, July 1880, E. P. V.; Ridgeway, Ont., Kilman,

MELITÆA, Fabr.

22. **M. Phæton,** Drury.
Rare. Elma, Colden, etc.

PHYCIODES, Doubld.

23. **P. nycteis,** Doubld.
Not common but generally distributed.

24. **P. tharos,** Drury.
a. Winter form *marcia* Edw.
b. Summer form *morpheus* Fabr.
Both forms of this species occur abundantly in open swampy woods, low meadows, and along the borders of streams.

GRAPTA, Kirby.

25. **G. Interrogationis,** Fabr. Dimorphic form *Fabricii* Edw.

26. **G. Interrogationis,** Fabr. Dimorphic form *umbrosa* Lintn.
Of this not uncommon species the form *Fabricii* is the more abundant.

27. **G. Comma,** Harris. *a.* Winter form, *Harrisi* Edw.
b. Summer form, *dryas* Edw.

28. **G. Progne,** Cram.
Our most abundant *Grapta.*

29. **G. Faunus,** Edw.
Rare. Buffalo, "July 1880, in garden; Hamburgh, larvæ on gooseberry," Kellicott.

30. **G. J-album,** Bd.-Lec.
Rare. Lancaster, Aug. 1883, fresh; Buffalo, found hybernating in numbers in a dwelling house in the winter of 1872—3, E. P. V.; Ridgeway, Ont., Kilman.

VANESSA, Fabr.

31. **V. Antiopa,** Linn.

32. **V. Californica,** Bd.
Accidental. One fresh example taken by J. P. Will at Griffin's Mills, Erie Co., July 1890.

33. **V. Milberti,** Godt.
Rare about Buffalo; more abundant in the hilly country toward the southern limit of our district.

PYRAMEIS, Doubld.

34. **P. Atlanta,** Linn.

35. **P. Huntera,** Fabr.

36. **P. Cardui,** Linn.

JUNONIA, Doubld.

37. **J. cœnia,** Hubn.
Very rare. Lancaster, two or three examples, E. P. V.; Buffalo, Fischer; "one specimen, June, Squaw Island," Kellicott; Ridgeway, Ont., Kilman and Moffat. (Can. Ent. XXII p. 264.)

LIMENITIS, Fabr.

38. **L. Ursula,** Fabr.
Very rare. Cattaraugus, Catt. Co., Will; Ridgeway, Ont., Kilman.

39. **L. Arthemis,** Drury. Dimorphic from *lamina*, Fabr.
Rare about Buffalo, more abundant among the hills in Colden, Aurora, etc.

40. **L. Arthemis,** Drury. Dimorphic form *proserpina*, Edw.
Very rare. "Big Woods" Holland, July 10, 1883, E. P. V.; Ridgeway, Ont., Kilman.

41. **L. disippus,** Godt.
Common.

NEONYMPHA, Westw.

42. **N. Canthus,** Bd.-Lec.
Locally not uncommon. Squaw Isd., Niagara River, E. P. V.; East Aurora, taken in numbers around a bog, July 12, 1890, Field Club; Ridgeway, Ont., Kilman.

43. **N. Eurytris,** Fabr.
Rare. Portage Falls, May 31, 1887, E. P. V.; "Buffalo Plains," Mœser.

SATYRUS, Westw.

44. **S. Alope,** Fabr. Dimorphic form *alope*, Fabr.
Not uncommon about thistle blossoms at Lancaster, E. P. V.

45. **S. Alope,** Fabr. Dimorphic form *nephele*, Kirby.
With *alope* but ordinarily more abundant. Last season (1890) following two open winters, *alope* was the predominant form. (See N. Am. Ent. I, p. 87.)

FAMILY LYCÆNIDÆ.

THECLA, Fabr.

46. **T. Acadica,** Edw.
Buffalo, Fischer.

47. **T. calanus,** Hubn.
Common on flowers of Asclepias etc. July.

48. **T. strigosa,** Harris.
"Lockport" Niag. Co.; (See Lintner, Fourth Rept. N.Y. State Ent. p. 137.)

49. **T. columella,** Fabr.
Accidental. East Aurora, Mr. O. Reinecke. (See Grote, Bul. Buff. Soc. Nat. Sci., I, p. 178, and III, p. 107.=*Callis-cista ocellifera*, Grote.)

50. **T. Niphon,** Hubn.
Rare. Portage Falls, May 30, 1888, on pines, E. P. V.

51. **T. Titus,** Fabr.
Lancaster, rare, E. P. V.; Buffalo, common, Fischer.

FENISECA, Grote.

52. **F. Tarquinius,** Fabr.
Very rare. Ridgeway Ont., one example, Kilman.

CHRYSOPHANUS, Doubld.

53. **C. Thoe,** Bd.-Lec.
Not uncommon.

54. **C. epixanthe,** Bd.-Lec.
"Taken on the border of a swamp in the rear of sand dunes, shore of Lake Ontario, July 5, 1885, abundant," Kellicott. Not yet taken in the immediate vicinity of Buffalo.

55. **C. hypophleas,** Bd.

LYCÆNA, Fabr.

56. *a.* **L. pseudargiolus,** Bd. Winter form *lucia*, Kirby.
b. Summer form *neglecta*, Edw.
Ordinarily this species is not common. It can be taken in open sunny places in woods and along their borders, especially among the hills south of Buffalo.

57. **L. comyntas,** Godt.
Rare. Ridgeway, Ont., Kilman.

FAMILY HESPERIDÆ.

ANCYLOXYPHA, Feld.

58. **A. Numitor,** Fabr.
Not uncommon at Lancaster and elsewhere about *Sagittaria* in swampy meadows and roadside ditches; July.

PAMPHILA, Fabr.

59. **P. Zabulon,** Bd.-Lec. var. *Hobomok*, Harris.
Common especially on low meadows and along the banks of streams, May to July.

60. **P. Zabulon,** Bd. Lec. Dimorphic form *Pocahontas*, Scudd.
Rare. Ridgeway, Ont., Kilman.

61. **P. Sassacus,** Harr.
Rare. Buffalo, "July," Kellicott.

62. **P. Peckius,** Kirby.
Our most abundant "skipper."

63. **P. Mystic,** Scudd.
Rare. Lancaster, two examples, E. P. V.

64. **P. Cernes,** Bd.-Lec.
Not uncommon.

65. **P. Metacomet,** Harris.
Rare. Ridgeway, Ont., Kilman.

66. **P. bimacula,** Grt. and Rob.
Rare. Lancaster and Colden, E. P. V.

67. **P. Pontiac,** Edw.
Buffalo, "June and July," Kellicott.

NISONIADES, Speyer.

68. **N. Brizo,** Bd.-Lec.
Jamestown, Chaut. Co., E. P. V.

69. **N. Lucilius,** Lintn.
"Pt. Abino, June; flying about the dunes where its food plant, *Aquilegia Canadensis*, was abundant," Kellicott.

70. **N. Persius,** Scudd.
Ridgeway, Ont., Kilman; Portage, N. Y., Kellicott.

71. **N. juvenalis,** Fabr.
Rare and local. Portage Falls, May 31, 1885, E. P. V.

PHOLISORA, Speyer.

72. **P. Catullus,** Fabr.
Buffalo, "Midsummer to Autumn. Larvæ may be found in tubes formed by rolling a leaf of *Chœnopodium album* or *Amarantus*." Kellicott.

ENDAMUS, Swains.

73. **E. Pylades,** Scudd.
Occasional, Lancaster, E. P. V.; Buffalo, Fischer: Ridgeway, Ont., Kilman.

74. **E. Tityrus,** Fabr.
Locally not uncommon.

Heterocera.

FAMILY SPHINGIDÆ.

HEMARIS, Dalm.

75. **H. tenuis,** Grote.
Not uncommon. Larvæ on *Symphoricarpus racemosus.* (Bul. Buff. Soc. Nat. Sci., II, p. 145: Can. Ent. XV, p. 238, and XVI, p. 143.)

76. **H. diffinis,** Boisd.
Ridgeway, Ont., Kilman; Buffalo, Mr. Frank Zesch. (Bul. Buff. Soc. Nat. Sci., I, p. 5.)

77. **H. Thysbe,** Fabr.
Common. (See Buff. Bul. I, p. 7 and Can. Ent. XV, p. 238.)

78. **H. Thysbe,** var. *uniformis* G. and R.
Ridgeway, Ont., Kilman; Buffalo, Grote, (Bul. Buff. Soc. Nat. Sci., I, p. 7.)

79. **H. Buffalœnsis,** G. and R.
"Buffalo", Grote. (See Bul. Buff. Soc. Nat. Sci., I, p. 7: Ann Lyc. Nat. Hy. N. Y. VIII, p. 439: Strecker, Lep. Heter. et Rhop. p. 140.)

AMPHION, Hubn.

80. **A. Nessus,** Cram.
Rare but generally distributed.

THYREUS, Swains.

81. **T. Abbotii,** Swains.
Lancaster, occasional at sugar in early evening about the last of June, also at light, E. P. V.; Ridgeway, Ont., Kilman. (Bul. Buff. Soc. Nat. Sci., IV, p. 31.)

DEILIPHILA, Ochs.

82. **D. gallii,** var. *chamœnerii* Harris.
Not common.

83. **D. lineata,** Fabr.
More abundant than the preceding.

PHILAMPELUS, Harris.

84. **P. Pandorus,** Hubn.
Seasonally quite common at Lancaster, about grape vines in copses and along the creek, elsewhere rare. Buffalo, at electric light, Fischer.

85. **P. Achemon,** Drury.
Rare. Lancaster, E. P. V.; Buffalo, Mœser; "Formerly abundant in the High St. cemetery," Fischer.

AMPELOPHAGA, Brem.

86. **A. Chœrilus,** Cram.
Rather rare.

87. **A. Myron,** Cram.
Common everywhere.

88. **A. versicolor,** Harris.
Local. Buffalo, not uncommon, Fischer. Not taken elsewhere. (Bul. Buff. Soc. Nat. Sci., I, p. 22 and IV, p. 62: Can. Ent. XVII, p. 78.)

DILOPHONOTA, Burm.

89. **D. obscura** Fabr.
Accidental. Ridgeway, Ont., Kilman.

90. **D. ello,** Fabr.
Very rare. Buffalo, Fischer.

PROTOPARCE, Burm.

91. **P. celus,** Hubn.
Common everywhere.

SPHINX, Linn.

92. **S. kalmiæ,** Sm. and Abb.
Moderately common.

93. **S. drupiferarum,** Sm. and Abb.
Not infrequent at light and at rest.

94. **S. Gordius,** Cram.
Rare. Lancaster, E. P. V.; Buffalo, Fischer.

95. **S. luscitiosa,** Clem.
One example, doubtless of this species, captured at Lancaster was accidentally destroyed before I had an oportunity to fully identify it.

96. **S. chersis,** Hubn.
Common.

97. **S. Canadensis,** Boisd.
Very rare, Buffalo, one example, Fischer.

98. **S. eremitus,** Hubn.
Not rare.

CERATOMIA, Harris.

99. **C. Amyntor,** Hubn.
Moderately abundant at all localities.

100. **C. undulosa,** Walk.
Not common, Lancaster, E. P. V.; Buffalo, Fischer. Ridgeway, Ont., Kilman.

ELLEMA, Clem.

101. **E. coniferarum,** Sm. and Abb.
"Canada near Buffalo, N. Y.," Clemens. (See Proc. Ent. Soc. Phil, V, p. 191.)

102. **E. bombycoides,** Walk.
Very rare. "One pair taken July 5th, 1885 on trunk of white pine growing on dunes along the shore of Lake Ontario." Kellicott.

TRIPTOGON, Brem.

103. **T. modesta,** Harris.
Rare. One pair taken under a tree of *Populus monilifera* July 27, 1876 at Lancaster, E. P. V.; "Buffalo and Tonawanda, larvæ on *Populus dilatata* and *tremuloides*," Kellicott; Buffalo, at electric light, Fischer, Mœser, etc. (See Buff. Bul. IV, p. 29.)

SMERINTHUS, Latr.

104. **S. geminatus,** Say.
Not uncommon. Lancaster, larvæ on willow, E. P. V.; Buffalo, Fischer.

PAONIAS, Hubn.

105. **P. excæcatus,** Sm. and Abb.
Common.

106. **P. Myops,** Sm. and Abb.
Very rare and local. Buffalo, in High St. Cemetery, etc., Fischer, Mœser.

CRESSONIA, G. and R.

107. **C. juglandis,** Sm. and Abb.
Occasional. Lancaster, E. P. V.; Buffalo, Will; Ridgeway, Ont., Kilman.

FAMILY ÆGERIADÆ.

TROCHILIUM, Scop.

108. **T. tibiale,** Harris.
"One specimen taken on Goat Isd. at Niagara Falls, resting on leaves of *Populus tremuloides*, August," Kellicott.

BEMBECIA, Hubn.

109. **B. marginata,** Harris.
Rare. Lancaster, one example, E. P. V.

SCIAPTERON, Staud.

110. **S. tricincta,** Harris.
Rare, Lancaster, E. P. V.; Buffalo, "bred from galls on willow and *Populus candicans*; probably follows *Saperda concolor* and *mœsta* as an inquiline," Kellicott. (Can. Ent. XIII, p. 3.)

FATUA, Hy. Edw.

111. **F. denudata,** Harris.
Buffalo, (?) June, Kellicott. (Can. Ent. XIII, p. 8.)

HARMONIA, Hy. Edw.

112. **H. pini**, Kellicott.
Buffalo, Portage Falls, N. Y., Pt. Abino, Ont. Larvæ boring in pine. "Abundant and injurious at Portage. At this station a Tachina fly was found parasitically destroying the pupæ while still in the pitch masses," Kellicott. (Can. Ent. XIII pp. 5 and 157.)

PODOSESIA, Mœsch.

113. **P. syringæ**, Harris.
"Destructive to white ash shade trees in Buffalo. Hundreds of pupa shells have been counted protruding from the trunk of a single tree. The moths were easily taken about the infested trees during forenoons of bright days in June," Kellicott. Also bred by J. P. Will.

SANNINA, Walk.

114. **S. exitiosa**, Say.
Common everywhere. (Can. Ent. XIII, p. 7.)

ÆGERIA, Fabr.

115. **A. pictipes**, G. and R.
Buffalo. "Taken from the trunks of plum, wild red cherry and wild black cherry." Kellicott. Bred by J. P. Will from cherry. (Can. Ent. XIII, p. 7.)

116. **A. pyri**, Harris.
Rare. Buffalo, Kellicott. (Can. Ent. XIII, p. 8.)

117. **A. acerni**, Clem.
Common wherever hard maples are planted as shade trees. (Can. Ent. XIII, p. 7.)

118. **A. tipuliformis**, Linn.
Common. (Can. Ent. XIII, p. 7.)

FAMILY THYRIDÆ.

THYRIS, Illig.

119. **T. maculata**, Harris.
Not uncommon among rank weeds near water at Lancaster and elsewhere.

FAMILY ZYGÆNIDAE.

ALYPIA, Hubn.

120. **A. octomaculata**, Fabr.
Many larvæ, presumably of this species, swept from vines and low weeds at Lancaster, July 22, 1890. E. P. V.

121. **A. Langtoni**, Couper.
Very rare. Buffalo, one example, Will.

EUDRYAS, Boisd.

122. **E. Unio,** Hubn.
Not common. Lancaster, Aug., E. P. V.; Buffalo, Fischer and Will. (Buff. Bul. IV, p. 29.)

123. **E. grata,** Fabr.
Common.

SCEPSIS, Walk.

124. **S. fulvicollis,** Hubn.
Moderately abundant at Lancaster, etc. (See Trans. Am. Ent. Soc. II, p. 116.)

CTENUCHA, Kirby.

125. **C. Virginica,** Charp.
Common. Aurora, July 12,; Lancaster, larvæ on *Panicum*, E. P. V. (Proc. Ent. Soc. Phil. II, p. 335: Buff. Bul. I, p. 33.)

LYCOMORPHA, Harris.

126. **L. Pholus,** Drury.
Rare and Local, "Buffalo, Aug. and Sept.", Kellicott; Ridgeway, Ont., Kilman.

FAMILY BOMBYCIDAE.

SARROTHRIPA.

127. **S. Lintnerana,** Speyer.
Occasional. Lancaster, E. P. V.; Ridgeway, Ont., Kilman.

NOLA, Leach.

128. **N. melanopa,** Zell.
Rare. Lancaster, Aug., E. P. V.

CLEMENSIA, Pack.

129. **C. albata,** Pack.
Common, especially in deep woods, July.

HYPOPREPIA, Hubn.

130. **H. fucosa,** Hubn.
Generally distributed and not rare.

131 **H. fucosa,** var. **miniata,** Kirby.
Common at Lancaster, elsewhere occasional.

CROCOTA, Hubn.

132. **C. rubicundaria,** Hubn.

133. **C. aurantiaca,** Hubn.

134. **C. ferruginosa,** Walk.

135. **C. quinaria,** Grote.
Lancaster, one example found flying in an orchard, E. P. V.

136. **C. opella,** Grote.
Chautauqua Co., Grote. (Bul. Buff. Soc. Nat. Sci. II, p. 151.)

UTETHISA, Hubn.

137. **U. bella,** Linn,
Occasional.

CALLIMORPHA, Latr.

138. **C. Clymene,** Brown, (= *interrupto-marginata* De B.)
Lancaster, rare, E. P. V.; Ridgeway Ont., common, Kilman; Buffalo, &c.

139. **C. colona,** Hubn. (= *Clymene* Esp.)
"Buffalo," Grote. (Can Ent. XX, p. 40.)

140. **C. Lecontei,** Boisd.
Buffalo, Kellicott.

141. **C. Lecontei,** var. **militaris,** Harris,
Buffalo, Kellicott.

142. **C. confusa,** Lyman.
Lancaster, E. P. V.; Ridgeway Ont., Kilman.

143. **C. contigua,** Walk.
Taken with the preceding.

EUPREPIA, Germ.

144. **E. Caja,** Linn.
Rare. Lancaster, three specimens taken in a ravine, E. P. V. Buffalo, one example, Moeser.

ARCTIA, Schrank.

145. **A. Virgo,** Linn.
146. **A. Saundersii,** Grote.
Buffalo, Fischer; Ridgeway Ont., Kilman.

147. **A. figurata,** Drury.
Rare. Lancaster, one example, E. P. V.

148. **A. Nais.,** Drury,

149. **A. decorata,** Saund.
Buffalo, Mœser; "St. Catherines, Ont", Grote. (Proc. Ent. Soc. Phil. II. p. 60.)

150. **A. virguncula,** Kirby.
Occasional, July. Lancaster, E. P. V.; Aurora, Miss A. M. Crawford; Buffalo, Moeser.

151. **A. Arge,** Drury.

PYRRHARCTIA, Pack.

152. **P. Isabella,** Abb. & Sm.

PHRAGMATOBIA, Steph.

153. **P. rubricosa,** Harris.
Rather rare.

LEUCARCTIA, Pack.

154. **L. acræa,** Drury.

SPILOSOMA, Steph.

155. **S. Virginica,** Fabr.
Like the foregoing a very common species at light.

156. **S. latipennis,** Stretch.
"Buffalo," J. B. Smith, (Can. Ent. XXII p. 162.)

HYPHANTRIA, Harris.

157. **H. cunea,** Drury.
Rare. Buffalo, Fischer and Will.

158. **H. textor,** Harris.
Very abundant everywhere.

EUCHÆTES, Harris.

159. **E. Egle,** Drury.

160. **E. collaris,** Fitch.
Not uncommon around *Apocynum cannabinum* on which its pretty larvæ feed.

ECPANTHERIA, Hubn.

161. **E. scribonia,** Stoll.
Rare. Lancaster, Buffalo, &c. One worn female taken about July 1st deposited 1758 eggs, the most of which hatched in about ten days. The large black caterpillars of this species are common but the imagines are but rarely taken.

HALESIDOTA, Hubn.

162. **H. tessellaris,** Abb. & Sm.

163. **H. Caryæ,** Harris.

164. **H. maculata,** Harris.
Rare. Lancaster, larvae on apple, E. P. V.; Buffalo, at electric light, Fischer, Will.

ORGYIA, Ochs.

165. **O. leucostigma,** Abb. & Sm.

PARORGYIA, Pack.

166. **P. Clintoni,** G. & R.
"Buffalo, Aug. 24. 1886," Fischer.

167. **P. parallela,** G. & R.
Lancaster, two examples taken at rest, E. P. V.

EUCLEA, Hubn.

168. **E. querceti,** H.-S.
Not uncommon. Lancaster, larvæ on willow, pear, maple, blue-beech &c., E. P. V.; Buffalo, Fischer.

169. **E. ferruginea,** Pack.
"St. Catherines Ont." (Proc. Ent. Soc. Phil. III p. 338).

PHOBETRON, Hubn.

170. **P. pithecium,** Abb. & Sm.
Rare. Lancaster, larvæ on apple, E. P. V.; Ridgeway Ont; Kilman. (Can. Ent. XVI pp, 180 & 200.)

LIMACODES, Latr.

171. **L. Scapha,** Harris.
Occasional. Lancaster, larvæ on blue beech, E. P. V.; Ridgeway Ont., Kilman.

172. **L. Y-inversa,** Pack.
Not a rare species.

173. **L. fasciola,** H.–S.

174. **L. flexuosa,** Grote.
Ridgeway Ont.., Kilman.

175. **L. cæsonia,** Grote.
Not uncommon at Ridgeway Ont., Kilman.

ADONETA, Clem.

176. **A. spinuloides,** H.–S.
Rare. Lancaster. E. P. V.; Ridgeway Ont., Kilman. (Can. Ent. XXX, p. 178.)

ICHTHYURA, Hubn.

177. **I. inclusa,** Hubn.
Taken commonly at all stations.

178. **I. inversa,** Pack.
Ridgeway Ont., Kilman.

179. **I. Albosigma,** Fitch.
Rare. Lancaster, E. P. V.; Buffalo, "Bred from *Populus tremuloides*. The larva maturing early in July spins a slight web between two leaves so that cocoon and pupa closely resemble those of a *Catocala*," Kellicott; Ridgeway, Ont.; Kilman.

APATELODES, Pack.

180. **A. Angelica,** Grote.
Rare. Ridgeway, Ont.; Kilman, (Can. Ent. XVII, p. 34.)

DATANA, Walk.

181. **D. ministra,** Drury.

182. **D. Angusii,** G. & R.
Not common. Lancaster, E. P. V.

183. **D. integerrima,** G. & R.
Ridgeway, Ont.; not uncommon, Kilman.

184. **D. contracta,** Walk.
Buffalo, Fischer.

NATADA, Walk.

185. **N. gibbosa**, Abb. & Sm.
Occasional.

GLUPHISIA, Boisd.

186. **G. trilineata**, Pack.
Locally abundant. Buffalo, at electric light, Fischer, Will, &c.

NOTODONTA, Ochs.

187. **N. stragula**, Grote.
Not common but widely distributed. Larvæ on *Salix nigra*, E. P. V.

188. **N. basistriens**, Walk.
Rare. Buffalo, one example, Fischer.

LOPHODONTA. Pack.

189. **L. Georgica**, H.-S.
Ridgeway, Ont., Kilman.

PHEOSIA, Hubn.

190. **P. rimosa**, Pack.
Rare. Lancaster, larvæ on *Symphoricarpus racemosus*, E. P. V.; Buffalo, Fischer.

NERICE, Walk.

191. **N. bidentata**, Walk.
This is also a rare species. Lancaster, E. P. V.; Ridgeway, Ont., Kilman.

EDEMA, Walk.

192. **E. albifrons**, Abb. & Sm.
Common. Larvæ destructive to the maple, basswood &c., at Lancaster, E. P. V.

SEIRODONTA, G. & R.

193. **S. bilineata**, Pack.
Rather rare. Lancaster, June, E. P. V.; Ridgeway, Ont., Kilman.

ŒDEMASIA, Pack.

194. **O. concinna**, Abb. & Sm.
The red-humped larvæ of this species are frequently encountered on the apple and various forest trees although the moths are of rare occurrence.

SCHIZURA, Doubld.

(= *Cœlodasys* Pack.)

195. **S. ipomeæ**, var. **cinereofrons**, Pack.
Rare. Buffalo, Fischer.

196. **H. unicornis**, Abb. & Sm.
Not uncommon, Lancaster, larvæ on rose, basswood &c., E. P. V.; Buffalo, "bred on apple, willow, honey-locust and linden", Kellicott.

JANASSA, Walk.

197. **J. lignicolor,** Walk.
Occasional. Buffalo, Fischer; Aurora, Miss A. M. Crawford; Ridgeway Ont., Kilman.

HETEROCAMPA, Doubld.

198. **H. guttivitta,** Walk.
Not uncommon

199. **H. Manteo,** Doubld.
Less abundant than the preceding. Buffalo, "One female on oak," Kellicott.

200. **H. marthesia,** Cram.
Buffalo, "one pair taken on an ash tree, Aug. 1883," Kellicott.

201. **H. unicolor,** Pack.
Buffalo, "bred from larvæ feeding on buttonwood," Kellicott.

CERURA, Schrank.

202. **C. borealis,** Boisd.
Rare. Buffalo, Fischer.

203. **C. occidentalis,** Lintn.
More abundant than its congeners.

204. **C. cinerea,** Walk.
Rare. Buffalo, Fischer. The species of this genus are most frequently taken at light.

PLATYPTERYX, Lasp.

205. **P. arcuata,** Walk.
Not uncommon in ravines and damp woods at Lancaster, E. P.V.

206. **P. genicula,** Grote.
"Pt. Abino and East Aurora, June," Kellicott.

ACTIAS, Leach.

207. **A. Luna,** Linn.
This is hardly a common species here although a few examples are captured each season.

TELEA, Hubn.

208. **T. Polyphemus,** Cram.
Common.

CALLOSAMIA, Pack.

209. **C. Promethea,** Drury.
The larvæ of this species are not uncommon on spice bush. They may also be found on willow and lilac.

210. **C. angulifera,** Walk.
Very rare. Ridgeway, Ont., Kilman. (See. Can. Ent. XVI, p. 119 & 179.)

PLATYSAMIA, Grote.

211. **P. Cecropia,** Linn.
Common at all stations.

HYPERCHIRIA, Hubn.

212. **H. Io,** Fabr.
Also a common species.

EACLES, Hubn.

213. **E. imperialis,** Drury.
Very rare. A single example of this splendid moth was captured in the village of Hamburgh about July 1st. 1890 and is now in the possession of Mr. Frank Walker of that place to whose kindness I am indebted for a knowledge of its occurrence. Prof. Kellicott reports: "One larva on Goat Island, Niagara Falls, and one moth taken at North Collins by Mr. Henry Clipperton of Buffalo."

ANISOTA, Hubn.

214. **A. Stigma,** Fabr.
Buffalo, Fischer.

215. **A. senatoria,** Abb. & Sm.
Ridgeway, Ont., Kilman.

216. **A. Virginiensis,** Drury.
Not rare. Lancaster. Larvæ on blue-beech, E. P. V., Buffalo, &c.

DRYOCAMPA, Harris.

217. **D. rubicunda,** Fabr.
Common.

CLISIOCAMPA, Curtis.

218. **C. Americana,** Harris.

219. **C. distria.** Hubn.

GASTROPACHA, Ochs.

220. **G. Americana,** Harris.
Rare. Lancaster, May, E. P. V.; Buffalo, Fischer; Ridgeway, Ont., Kilman.

TOLYPE, Hubn.

221. **T. velleda,** Stoll.
Occasional. Lancaster, at light and at rest on apple, E. P. V. Buffalo, Fischer; Ridgeway, Ont., Kilman.

222. **T. laricis,** Fitch.
Very rare. Buffalo, one example at electric light, Fischer.

PRIONOXYSTUS, Grote.

223. **P. robiniae,** Peck.
Generally distributed but not common, (Bul. Buff. Soc. Nat. Sci. IV, p. 30.)

224. **P. querciperda,** Fitch.
"Buffalo, from branches of black oak growing on "The Circle," Kellicott.

HEPIALUS, Fabr.

225. **H. auratus,** Grote.
Very rare. Lancaster, a single example taken at rest on a bush of wild gooseberry, July 23rd, 1888, E. P. V. (Can Ent. XX, p. 100.)

226. **H. argenteomaculatus,** Harris.
"Certainly occurs along the shore of Lake Ontario eastward of Buffalo, wherever *Alnus incana* abounds," Kellicott; Ridgeway, Ont. Kilman.

227. **H. quadriguttatus,** Grote.
Lancaster, one specimen at light, E. P. V.; Buffalo, Mœser.

FAMILY NOCTUIDÆ.

LEPTINA, Guen.

228. **L. ophthalmica,** Guen.
Occasional. Lancaster, taken on the wing in meadow-land E. P. V.

229. **L. latebricola,** Grote.
Ridgeway, Ont.. two examples, Kilman. Determined by Prof. J. B. Smith.

THYATIRA, Ochs.

230. **T. pudens,** Guen.
Lancaster, one example at rest about July 1st, E. P. V.

PSEUDOTHYATIRA, Grote.

231. **P. cymatophoroides,** Guen.
Lancaster, July, at sugar, E. P. V.

232. **P. cymatophoroides,** var. **expultrix,** Grote.
June and July, at sugar.

HABROSYNE, Hubn.

233. **H. scripta.** Gosse.
June, at sugar.

ARSILONCHE, Led.

234. **A. Henrici,** Grote.
May, at sugar and light. (Bul. Buff. Soc. Nat. Sci. I, p. 12.)

RAPHIA, Hubn.

235. **R. abrupta,** Grote.
Buffalo, Fischer.

236. **R. Frater,** Grote.
Rare. Lancaster, at rest, E. P. V.

DEMAS, Steph.

237. **D. flavicornis**, Smith.
Buffalo, July, one example at electric light, Fischer.

CHARADRA, Walk.

238. **C. deridens**, Guen.
Lancaster, at rest, E. P. V.; Ridgeway, Ont., Kilman.

AUDELA, Walk.

239. **A. acronyctoides**, Walk.
"Western N. Y.", Grote. (Hy. Bul. VI, p. 227.)

PLATYCERURA, Pack.

240. **P. furcilla**, Pack.
Buffalo, July, one example, Fischer; Ridgeway, Ont., Kilman.

FERALIA, Grote.

241. **F. jocosa**, Guen.
"West Seneca," Kellicott.

MOMAPHANA, Grote.

242. **M. Comstocki**, Grote.
Rare. Portage Falls, May 30th, 1885, one example at rest, E. P. V.; Buffalo, Kellicott. (Hy. Bul. VI, p. 569.)

DIPHTHERA, Hubn.

243. **D. fallax**, H.-S.
Buffalo, Fischer, Kellicott.

APATELA, Hubn.

244. **A. occidentalis**, G. & R.
June and July, common at sugar. Larvæ on apple and raspberry, E. P. V.

245. **A. morula**, G. & R.
Lancaster, July, at sugar, E. P. V.; Ridgeway, Ont., Kilman.

246. **A. lobeliæ**, Guen.
June and July, at sugar.

247. **A. vinnula**, Grote.
August, at sugar.

248. **A. Harveyana**, Grote.
Lancaster, June, occasional at sugar, E. P. V.

249. **A. spinigera**, Guen.
Buffalo, Kellicott.

250. **A. lepusculina**, Guen.

251. **A. innotata**, Guen.
Lancaster, Aug., at sugar, rare; Buffalo, at electric light, abundant in 1888, E. P. V.; Ridgeway, Ont., Kilman.

252. **A. Americana,** Harris.
Not uncommon, June, at sugar and at rest.

253. **A. dactylina,** Grote.
Buffalo, Kellicott.

254. **A. luteicoma,** G. & R.
Buffalo, Fischer.

255. **A. subochrea,** Grote.
Lancaster, May and June, at sugar, E. P. V.; Buffalo and St. Catherines Ont., Grote. (Bul. Buff. Soc. Nat. Sci. II, p. 574.)

256. **A. noctivaga,** Grote.
Lancaster, May and June, common at sugar, E. P. V.

257. **A. superans,** Guen.
June and July, at sugar.

258. **A. connecta,** Grote.
Rare. Lancaster, July. on sugar, E. P. V.; Buffalo, Fischer.

259. **A. ovata,** Grote.
Buffalo, Kellicott.

260. **A. hamamelis,** Guen.
Lancaster, at rest on beech trees and at sugar, July, E. P. V.

261. **A. retardata,** Walk. (= *dissecta*, G. & R.)
Lancaster, June and July, not uncommon on trunks of maple trees, E. P. V,; Ridgeway, Ont. Kilman.

262. **A. sperata,** Grote.
Common, May to August, at sugar and light.

263. **A. xyliniformis,** Guen.
Ridgeway, Ont., Kilman.

264. **A. oblinita,** Abb. & Sm.
Lancaster, May to Aug., at rest and sugar, larvæ on smartweed, E. P. V.

HARRISIMEMNA, Grote.

165. **H. trisignata,** Walk.

PACHYCERMA, Grote.

266. **P. Cora,** Hubn.
Ridgeway, Ont., Kilman.

POLYGRAMMATE, Hubn.

267. **P. Hebraicum,** Hubn.
Ridgeway, Ont., Kilman.

MICROCŒLIA, Guen.

268. **M. fragilis,** Guen.
Rare. Lancaster, July and Aug., at light and sugar, E. P. V.

269. **M. diphteroides,** Guen.
Ridgeway, Ont., Kilman.

270. **M. diphteroides,** var. **obliterata** Grote.
Lancaster, June, not uncommon on sugar, E. P. V.

BRYOPHILA, Tr.

271. **B. lepidula,** Grote.
July and Aug., at sugar.

272. **B. teratophora,** H.-S.
Occasional. Lancaster, at sugar, E. P. V.

CHYTONIX, Grote.

273. **C. palliatricula,** Guen.
Buffalo, Will.

RHYNCHAGROTIS, Smith.

274. **R. rufipectus,** Morr.
Rare. Lancaster, Aug., one example taken, E. P. V.

275. **R. brunneicollis,** Grote.
Occasional. At sugar.

276. **R. cupida,** Grote.
Rare. Lancaster, Sept., at sugar, E. P. V.

277. **R. alternata,** Grote.
August, at sugar.

ADELPHAGROTIS, Smith.

278. **A. prasina,** Fabr.
Occasional. Lancaster, July, at sugar and light, E. P. V.; Ridgeway, Ont., Kilman.

PLATAGROTIS, Smith.

279. **P. pressa,** Grote.
Buffalo, Kellicott

EUERETAGROTIS, Smith.

280. **E. sigmoides,** Guen.
Buffalo, Fischer.

281. **E. perattenta,** Grote.
Buffalo, Kellicott.

SEMIPHORA, Steph.

282. **S. elimata,** Guen.
Buffalo, Kellicott.

283. **S. Catherina,** Grote.
St. Catherines, Ont., Norman. (Can. Ent. VI, p. 117.)

AGROTIS, Tr.

284. **A. Ypsilon,** Rott.
Very common throughout the season, especially in late autumn on corn stalks in the field, also at sugar.

PERIDROMA, Hubn.

285. **P. occulta,** Linn.
Buffalo, Fischer and Mœser.

286. **P. saucia,** Hubn.
Common.

NOCTUA, Linn.

287. **N. baja,** Fabr.
August, at sugar.

288. **N. Normaniana,** Grote.
Ridgeway, Ont., Kilman.

289. **N. bicarnea,** Guen.
Scarce. Lancaster, on flowers and at rest, Aug., E. P. V. Ridgeway, Ont., Kilman.

290. **N. C.-nigrum,** Linn.
Very abundant everywhere throughout the season.

291. **N. perconflua,** Grote.
Buffalo, at electric light, Fischer.

292. **N. Eriensis,** Grote.
"Erie Co." Grote. (Hy. Bul. IV, p. 172; Smith, Monog. Genus Agrotis, p. 84.)

293. **N. plecta,** Linn.
Rare, but generally distributed.

294. **N. haruspica,** Grote.
Not uncommon. July, frequently taken at rest under boards and loose bark, also at sugar.

295. **N. clandestina,** Harris.
Common at sugar and at rest under boards.

FELTIA, Walk.

296. **F. subgothica,** Steph.
Very common at sugar and on flowers, especially of the golden rod and *Helianthus*, July to Sept.

297. **F. jaculifera,** Guen. (= *tricosa*, Lintn.)
Buffalo, Will.

298. **F. herilis,** Grote.
With *subgothica* but less abundant.

299. **F. gladiaria,** Morr.
Rare. Lancaster, Sept. 1883, one example, E. P. V.

300. **F. venerabilis,** Walk.
Common on golden-rod, Sept. This species feeds by day more frequently than its congeners.

301. **F. volubilis,** Harvey.
Seasonally common. June, on sugar. (Bul. Buff. Soc. Nat. Sci. II, p. 118.)

POROSAGROTIS, Smith.

302. **P. murænula**, G. & R.
"Erie Co." Grote. (Bul. Buff. Soc. Nat. Sci. III, p. 73.)

303. **P. Rileyana,** Morr.
Occasional. Lancaster, on golden-rod, E. P. V.; Buffalo, Will.

CARNEADES, Grote.

304. **C. plagigera,** Morr.
Buffalo, Fischer.

305. **C. scandens,** Riley.
Rare. Lancaster on flowers, E. P. V.; "Erie Co." Grote. (Bul. Buff. Soc. Nat. Sci. III, p. 73.)

306. **C. pitychrous,** Grote.
Buffalo, Kellicott; Ridgeway, Ont., Kilman.

307. **C. Bostoniensis,** Grote.
Buffalo, Fischer.

308. **C. messoria,** Harris, (= *repentis*, G. & R.)
Buffalo, Kellicott, Fischer; Ridgeway, Ont., Kilman.

309. **C. insignata,** Walk. (= *decolor*, Morr.)
Rare. Lancaster, Aug., on sugar, E. P. V.

310. **C. tessellata,** Harris.
Common, Aug. to Sept., on sugar.

311. **C. redimicula,** Morr.
Not common. Lancaster, on sugar, Sept. 1st, 1881, E. P. V.

ANYTUS, Grote.

312. **A. sculptus,** Grote.
Occasional. Lancaster Sept., E. P. V.; Buffalo, Fischer.

MAMESTRA, Ochs.

313. **M. nimbosa,** Guen.
Buffalo, Kellicott.

314. **M. imbrifera,** Guen.
Rare.

315. **M. latex,** Guen.
Not uncommon. June, at sugar and at rest.

316. **M. adjuncta,** Boisd.
Occasional. July and Aug., at sugar.

317. **M. lubens,** Grote.
Buffalo, Kellicott.

318. **M. legitima,** Grote.
Not rare. Lancaster, at sugar, June; larvæ on *Calendula*, E. P. V.; Buffalo, at electric light, Fischer.

319. **M. lilacina,** Harvey.
Rare. Lancaster, July 31st, 1879, on sugar, E. P. V.

320. **M. Goodelli,** Grote.
Lancaster, May 31st, 1878, at sugar, E. P. V.

321. **M. rosea,** Harris.
Occasional. June, at light and sugar.

322. **M. picta,** Harris.
Common. June to Aug., at light and sugar.

323. **M. grandis,** Boisd.
Occasional, June and July, at sugar.

324. **M. subjuncta,** G. & R.
Common, June and July, at sugar.

325. **M. Atlantica,** Grote.
Buffalo, Kellicott, Fischer.

326. **M. confusa,** Hubn.
Buffalo, Fischer. This determination is somewhat doubtful.

327. **M. trifolii,** Rott.
Rare. June to Aug., at sugar and rest.

328. **M. renigera,** Steph.
Very common on sugar and flowers, especially of valerian, June to Sept.

329. **M. lorea,** Guen.
Of common occurrence with the preceding, larvæ on grass &c.

330. **M. detracta,** Walk.
Rather rare. Lancaster, two examples, E. P. V.; Buffalo, Will.

331. **M. cuneata,** Grote.
Buffalo, Fischer.

332. **M. olivacea,** Morr.
Lancaster, Aug., at sugar, E. P. V.

DIANTHŒCIA, Boisd.

333. **D. vicina,** Grote.
"St. Catherines, Ont.," Grote. (Bul. Buff. Soc. Nat. Sci. II, p. 156.)

334. **D. meditata,** Grote.
Common. Aug., at sugar and flowers.

NEPHELODES, Guen.

335. **N. minians,** Guen.
Occasional at light and at rest. Sept.

336. **N. minians,** var. **violans,** Guen.
Rare. Lancaster, E. P. V.

TRICHOLITA, Grote.

337. **T. signata,** Walk.
Rare. Lancaster, July. at sugar, E. P. V.

MACRONOCTUA, Grote.

338. **M. onusta,** Grote.
Lancaster, one example, E. P. V.

ONCOCNEMIS, Led.

339. **O. riparia,** Morr.
"Buffalo and shores of Lake Erie", Grote. (Can. Ent. XII, p. 256; and XIII, p. 231.)

HOMOHADENA, Grote.

340. **H. badistriga,** Grote.
Rare. Lancaster, larvæ on *Lonicera flava*, E. P. V.; Ridgeway, Ont., Kilman.

HADENA, Schrank.

341. **H. passer,** Guen.
Not common. Lancaster, Sept., E. P. V.; Buffalo, Will. Mœser.

342. **H. ducta,** Grote.
Buffalo, Fischer.

343. **H. devastatrix,** Brace.
Very abundant everywhere and an unmitigated nuisance at the sugared trees, where, by its precipitate departure on the approach of the collector's light, it either knocks off or frightens away many valuable specimens.

344. **H. separans,** Grote.
Buffalo, Fischer.

345. **H. arctica,** Boisd.
Very common at light and sugar.

346. **H. sputatrix,** Grote.
Common. Aug. and Sept. at light and sugar.

347. **H. illata,** var. **suffusca,** Morr.
Lancaster, June and July, on flowers, E. P. V.

348. **H. vultuosa,** Grote.
Rare. Lancaster, one example, May 27th, 1878, E. P. V.

349. **H. lignicolor,** Guen.
Common. July. Frequently taken at rest under boards and around corners and crevices of out-buildings.

350. **H. verbascoides,** Guen.
Not uncommon, June.

351. **H. sectilis,** Guen.
Buffalo, Kellicott, Fischer.

352. **H. vulgaris,** G. & R.
Rare. Lancaster, June, at sugar, larvæ on corn, E. P. V.; Ridgeway Ont., Kilman.

352½ **H. cristata,** Grote.
"Buffalo," Grote. (Bul. U. S. Geol. and Geog. Surv. IV, p. 176; Proc. U. S. Nat. Mus. XIII p. 436.)

353. **H. idonea,** Grote.
Rare. Lancaster, E. P. V.

354. **H. remissa,** Hubn.
Rare. Lancaster, one example, E. P. V.

355. **H. finitima,** Guen.
Common. May and June, at sugar.

356. **H. impulsa,** Guen.
Occasional. Lancaster, June, at sugar, E. P. V.; Buffalo.

357. **H. mactata,** Guen.
Rather rare. Lancaster, at sugar, E. P. V.

358. **H. miselioides,** Guen.
Another uncommon species. Lancaster, July, at sugar, E. P. V.; Buffalo, Fischer.

359. **H. modica,** Guen.
Common. August, at sugar.

360. **H. vulgivagata,** var. **fractilinea,** Grote,
Occasional. Lancaster, Aug., E. P. V.

DIPTERYGIA, Steph.

361. **D. scabriuscula,** Linn.
Common at sugar, June and July.

HYPPA, Dup.

362. **H. xylinoides,** Guen.
Very common everywhere, June to Aug.

ACTINOTIA, Hubn.

263. **A. ramosula,** Guen.
Not an uncommon species at light and sugar, June.

OLIGIA, Hubn.

364. **O. chalcedonia,** Hubn.
Buffalo, Fischer.

365. **O. chalcedonia,** var. **arna,** Guen.
Lancaster, at sugar, E. P. V.

366. **O. versicolor,** Grote.
Rare. Lancaster, one example at sugar, E. P. V.

PERIGEA, Guen.

367. **P. luxa,** Grote.
Lancaster, June, E. P. V.

LAPHYGMA, Guen.

368. L. frugiperda, var. obscura, Riley.
Occasional.

PRODENIA, Guen.

369. P. lineatella, Harvey.
Buffalo, Will.

370. P. flavimedia, Harvey.
Lancaster, at sugar, E. P. V.

TRIGONOPHORA, Hubn.

371. T. periculosa, Guen.
Taken occasionally at rest.

372. T. periculosa, var. V-brunneum, Grote.
Rare.

BROTOLOMIA, Led.

373. B. Iris, Guen.
Lancaster, June, not infrequent at sugar and at rest, E. P. V.

EUPLEXIA, Steph.

374. E. lucipara, Linn.
Occasional, June to Aug., on sugar and flowers.

HELOTROPHA. Led.

375. H. reniformis, Grote.
Rare. Lancaster, at sugar, E. P. V.

376. H. reniformis, var. atra, Grote.
Lancaster, Aug. 30th, 1878, one example on sugar, E. P. V.; Ridgeway, Ont., Kilman.

377. H. sera, G. & R.
Common.

GORTYNA, Hubn.

378. G. immanis, Guen.
Ridgeway, Ont., Kilman.

379. G. nictitans, Esp.
Common, July and Aug.

380. G. nictitans, var. erythrostigma, Haw.

381. G. inquæsita, G. & R.
Rare. Lancaster, at rest, E. P. V.

382. G. rigida, Grote.
Very rare. Lancaster, one example, E. P. V.

383. G. cataphracta, Grote.
Buffalo, Fischer; Ridgeway, Ont., Kilman.

384. G. rutila, Guen.
Occasional.

385. **G. cerussata,** Grote.
Buffalo, Fischer.

386. **G. necopina,** Grote.
Lancaster, three examples, at rest, E. P. V.; Buffalo, Fischer, three examples.

387. **G. nitela,** Guen.
Not common. Lancaster, one example at light, Sept. 23rd, 1876, E. P. V.; Buffalo &c.

388. **G. nitela,** var. **nebris,** Guen.
Rare. Lancaster, one example, bred from potato, E. P. V.; Buffalo, Fischer.

OCHRIA, Hubn.

389. **O. Buffaloensis,** Grote.
Buffalo, Kellicott.

ACHATODES, Guen.

390. **A. zeæ,** Harris.
Buffalo, bred from elder stalks in numbers, Mr. O. Reinecke; on electric light, Will; Colden, E. P. V.; Ridgeway, Ont., Kilman; Jamestown, Dr. Waterhouse;

SPHIDA, Grote.

391. **S. obliquata,** G. & R.
Buffalo, "Abundant, larvæ in *Typha latifolia*," Kellicott. (Bul. Buff. Soc. Nat. Sci. V, p. 40; Can. Ent. XXI p. 39.)

NONAGRIA, Ochs.

392. **N. subcarnea,** Kellicott.
Buffalo, "Abundant, larvæ in *Typha latifolia*," Kellicott, (Bul. Buff. Soc. Nat. Sci. V, p. 40.)

HELIOPHILA, Hubn.

393. **H. pallens,** Linn.
Common. June and July, on sugar and flowers.

394. **H. albilinea,** Hubn.
Not a common species. Generally taken at light. (See Bul. Buff. Soc. Nat. Sci. I, p. 9, *Leucania Harveyi.*)

395. **H. phragmitidicola,** Guen.
Abundant on flowers and at sugar, June to Sept.

396. **H. adonea,** Grote.
Buffalo, Fischer.

397. **H. commoides,** Guen.
Very abundant everywhere, June and July.

398. **H. unipuncta,** Haw.
Seasonally very abundant, especially so in 1882, June. A frequent visitor at sugar.

399. **H. pseudargyria,** Guen.
Common at sugar and flowers, June and July.

SCOLECOCAMPA, Guen.

400. **S. liburna,** Geyer.
Occasional. Lancaster, July, at light, E. P. V.

NOLAPHANA, Grote.

401. **N. malana,** Fitch.
Common, June.

402. **N. Zelleri,** Grote.
Lancaster, June, E. P. V.

403. **N. labecula,** Grote.
"Erie Co., N. Y.," Grote. (Can. Ent. XII, p. 217.)

ADIPSOPHANES, Grote.

404. **A. miscellus,** Grote.
Occasional. Lancaster, May, E. P. V.; Ridgeway, Ont.,

CRAMBODES, Guen.

405. **C. talidiformis,** Guen.
Rare. Lancaster, taken in open woodland, E. P. V.; Ridgeway, Ont., Kilman.

CARADRINA, Treits.

406. **C. miranda,** Grote.
Not uncommon, Lancaster, July and Aug. Frequently taken about new made hay.

PYROPHILA, Hubn.

407. **P. pyramidoides,** Guen.
Of frequent occurrence on sugar and at light, July to Sept.

408. **P. tragopoginis,** Linn.
Common. July.

ORTHODES, Guen.

409. **O. infirma,** Guen.

410. **O. cynica,** Guen.
May and June, moderately common at sugar and flowers.

411. **O. enervis,** Guen.
Buffalo, Kellicott, "Determined by Mr. Grote as *O. vecors*, variety."

TÆNIOCAMPA, Guen.

412. **T. oviduca,** Guen.
Occasional. Lancaster, June, on sugar, E. P. V.

413. **T. incerta,** Hubn.
Very common in early spring. April and May, on sugar and flowers, especially on willow catkins. "St. Catherines Ont." (Can. Ent. VI, p. 117, *alia.*)

CROCIGRAPHA, Grote.

414. **C. Normani,** Grote.
Common, May and June, on sugar and flowers, especially of the lilac. (See: Can. Ent. VI, p. 116.)

MORRISONIA, Grote.

415. **M. evicta,** Grote.
Rare. Lancaster, one example, E. P. V.

416. **M. evicta,** var. **vomerina,** Grote.
Also of rare occurrence, Lancaster, May, at light and sugar, E. P. V.

CHŒPHORA, G. & R.

417. **C. fungorum,** G. & R.

COSMIA, Led.

418. **C. paleacea,** Esp.
Rather rare. Lancaster, Aug. 9th 1878, one example at light; E. P. V.; "Chautauqua Co., N. Y.," Grote. (Bul. Buff. Soc. Nat. Sci. II, p. 160, *Orthosia infumata.*)

PARASTICHTIS, Hubn.

419. **P. discivaria,** Walk.
Lancaster, July, at sugar, E. P. V.; "St. Catherines, Ont.," Grote. (Bul. Buff. Soc. Nat. Sci. II, p. 143, *Tæniosea gentilis.*)

420. **P. discivaria,** var. **perbellis,** Grote.
"St. Catherines, Ont.," Grote. (Bul. Buff. Soc. Nat. Sci. II, p. 144, *Tæniosea perbellis.*)

ANCHOCELIS, Guen.

421. **A. digitalis,** Grote.
Buffalo, Will.

ORTHOSIA, Ochs.

422. **O. ferrugineoides,** Guen.
Common.

423. **O. ferrugineoides,** var. **bicolorago,** Guen.
At times very abundant on sugar.

424. **O. euroa,** G. & R.
Ridgeway, Ont., Kilman.

EPIGLÆA, Grote.

425. **E. decliva,** var. **deleta,** Grote.
Rare. Lancaster, two examples in late autumn, E. P. V.

XANTHIA, Tr.

426. **X. togata,** Esp.
Buffalo, one example, Will.

EUCIRRŒDIA, Grote.

427. **E. pampina,** Guen.
Occasional.

SCOLIOPTERYX, Germ.

428. **S. libatrix,** Linn.
Common from May to November.

SCOPELOSOMA, Curtis.

429. **S. Græfiana,** Grote.
Lancaster, occasional among dry leaves in late autumn, E. P. V.; Ridgeway, Ont., Kilman.

430. **S. Moffatiana,** Grote,
Ridgeway, Ont., Kilman.

431. **S. ceromatica,** Grote.
Lancaster, Oct., E. P. V.; Ridgeway, Ont., Kilman.

432. **S. devia,** Grote.
Rare. Lancaster, March and April, on sugar, E. P. V.

433. **S. Morrisoni,** Grote.
Our most abundant species of *Scopelosoma*, March to May. Occurs at sugar and among dry leaves and standing corn in late autumn, also in early spring around sap-troughs and other paraphenalia of a sugar-bush.

434. **S. tristigmata,** Grote.
Occasional with the preceding, April, May and Oct. Some deeply colored examples recall *S. ceromatica*.

435. **S. Walkeri,** Grote.
Rather rare, Lancaster, April and May, E. P. V.; Buffalo, March, David F. Day. (Bul. Buff. Soc. Nat. Sci. I, p. 192.)

436. **S. vinulenta,** Grote.
Rare. Lancaster, July, E. P. V.; Ridgeway, Ont., Kilman.

LITHOPHANE, Hubn.

437. **L. disposita,** Morr.
Common. On sugar, flowers &c.

438. **L. petulca,** Grote.
Not uncommon. Lancaster, on sugar, E. P. V.

439. **L. ferrealis,** Grote.
Rare. Lancaster, May, on sugar, E. P. V.; Ridgeway, Ont., Kilman.

440. **L. signosa,** Walk.
Rare. Lancaster, April, on sugar, E. P. V.; Ridgeway, Ont., Kilman.

441. **L. Bethunei,** G. & R.
Common.

442. **L. semiusta,** Grote.
Rare. Lancaster, E. P. V.; Ridgeway, Ont., Kilman.

443 **L. antennata,** Walk.
Common on sugar and at light.

444. **L. laticinerea,** Grote.
Not uncommon. Lancaster, April, on sugar, E. P. V.

445. **L. unimoda,** Lintn.
Lancaster, one example taken March 12th 1878, E. P. V.

446. **L. Baileyi,** Grote.
Rare. Lancaster, one example taken on sugar, Sept., E. P. V.; Buffalo, Will.

447. **L. pexata,** Grote.
Lancaster, two examples taken on sugar, April 8th 1878, E. P. V.

CALOCAMPA, Steph.

448. **C. nupera,** Lintn.
Occasional at sugar and among standing corn in late autumn. April and Oct.

449. **C. cineritia,** Grote.
Lancaster, one example taken March 12th 1878, E. P. V.

450. **C. curvimacula,** Morr.
Common with *C. nupera*, also on sunflowers, goldenrod, &c.

LITHOMIA, Hubn.

451. **L. germana,** Morr.
Rare. Lancaster, at sugar, Sept., E. P. V.

XYLOMIGES, Guen.

452. **X. confusa,** Hubn.
Rare. Lancaster, one example taken at rest, May 17th 1876, E. P. V. This specimen was determined by Mr. Grote, but the name is not in his later lists.

CUCULLIA, Schrank.

453. **C. convexipennis,** G. & R.
Buffalo, Kellicott, Fischer.

454. **C. asteroides,** Guen.
Common on flowers, especially of the lilac, phlox, and valerian. June and July.

455. **C. intermedia,** Speyer.
With the preceding but less common.

456. **C. Speyeri,** Lintn.
Occasional on flowers. Lancaster, Sept., E. P. V.

MARASMALUS, Grote.

457. **M. Histrio,** Grote.
Lancaster, one example, E. P. V.

INGURA, Guen.

458. **I. Oculatrix,** Guen.
Rare. Lancaster, July, E. P. V.

ALETIA, Hubn.

459. **A. argillacea,** Hubn.
This species generally appears in considerable numbers about October 1st at sugar and especially around the electric lights in Buffalo; last season (1890), however, none were reported. (See Bul. Buff. Soc. Nat. Sci. I, p. 170; and IV, p. 61; Ent. News II, p. 12).

TELESILLA, H. & S.

460. **T. cinereola,** Guen.
Common at sugar, light &c., especially at Lancaster, July, and August.

HABROSTOLA, Ochs.

461. **H. urentis,** Guen.
Rare. Lancaster, Aug., Buffalo, at electric light. E. P. V.; Ridgeway, Ont., Kilman.

PLUSIA, Fabr.

462. **P. Ærea,** Hubn.
Not uncommon.

463. **P. æreoides,** Grote.
Lancaster, July, one example, E. P. V.

464. **P. balluca,** Geyer.
Rather rare. Lancaster, Aug., on phlox; abundant in spring of 1876 on flowers of the golden current, E. P. V.; Buffalo, Will; Ridgeway, Ont., Kilman.

465. **P. contexta,** Grote.
Rare. Lancaster, three examples taken on sunflowers &c. June and August, 1884, E. P. V.

466. **P. thyatiroides,** Guen.
Very rare. Buffalo, one example taken at rest Sept. 14th 1889; Lancaster Sept. 21st 1890, one example at light, E. P. V.; Ridgeway, Ont., Kilman.

467. **P. biloba,** Steph.
Occurs occasionally on lilac, flowering cherry, &c., also at electric light. June and July.

468. **P. precationis,** Guen.
Of plentiful occurrence throughout the season on flowers and at light. Three examples taken at sugar, E. P. V.

469. **P. mortuorum,** Guen.
Rare. Lancaster and Buffalo, at rest, E. P. V.; larvæ on caraway.

470. **P. viridisignata,** Grote.
Very rare. Lancaster, two examples taken at rest, E. P. V.

471. **P. simplex,** Guen.
Common everywhere, June to August.

DEVA, Walk.

472. **D. purpurigera,** Walk.
Rare. Lancaster, June, E. P. V.

CALPE, Tr.

473. **C. Canadensis,** Beth.
Larvæ not uncommon on meadow-rue.

PLUSIODONTA, Guen.

474. **P. compressipalpis,** Guen.
Apparently a rare species.

PLAGIOMIMICUS, Grote.

475. **P. pityochromus,** Grote.
Buffalo, Will.

HELIOTHIS, Hubn.

476. **H. armiger,** Hubn.
Occasional. Lancaster, E. P. V.; Buffalo, at electric light, Fischer, Will.

PYRRHIA, Hubn.

477. **P. umbra,** Hubn.
Lancaster, July, E. P. V.

478. **P. angulata,** Grote.
Occasional.

RHODOPHORA, Guen.

479. **R. florida,** Guen.
Seasonally quite plentiful in flowers of *Œnothera biennis* on the pods of which the larvæ feed. (See N. Am. Ent. I, p. 30).

LYGRANTHŒCIA, G. & R.

480. **L. marginata,** Haw.
Taken occasionally at light, August.

481. **L. Spraguei,** Grote.
I have taken this rare little species at Lancaster in August.

TARACHE, Hubn.

482. **T. erastrioides,** Guen.
On grass. Lancaster, E. P. V.; Ridgeway, Ont., Kilman.

483. **T. candefacta,** Hubn.
Common in meadows, Sept.

484. **T. terminimaculata,** Grote.
Rare. Lancaster, on weeds in open woods, E. P. V.; Ridgeway, Ont., Kilman.

CHAMYRIS, Guen.

485. **C. Cerintha,** Treits.
Not uncommon at light, sugar, &c. July.

EUHERRICHIA, Grote.

486. **E. monetifera,** Guen.
Buffalo, Fischer.

487. **E. mollissima,** Guen.
Rare. Lancaster, June, on sugar, E. P. V.; Ridgeway, Ont., Kilman.

EUSTROTIA, Hubn.

488. **E. albidula,** Guen.
Quite common and generally distributed. July.

489. **E. concinnimacula,** Guen.
Rare. Lancaster, May and June, E. P. V.; Ridgeway, Ont., Kilman.

490. **E. synochitis,** G. & R.
Not uncommon.

491. **E. muscosula,** Guen.
Common at sugar, flowers &c.

492. **E. apicosa,** Haw.
With the preceding and equally abundant.

493. **E. carneola,** Guen.
Another common species. June and July.

GALGULA, Guen.

494. **G. hepara,** Guen.
Occasional, July and Aug.

495. **G. subpartita,** Guen.
Buffalo, Fischer.

DRASTERIA, Hubn.

496. **D. erechtea,** Cram.
Very abundant everywhere in meadows.

497. **D. erechto,** Guen.
With the preceding, than which it is even more abundant. *Erechtea* prefers the damper fields while the present species commonly selects a dryer location such as an upland meadow or pasture.

EUCLIDIA, Hubn.

498. **E. cuspidea,** Hubn.
An inhabitant of deep woods. There it may be found through June and July resting on the ground among dry sticks and leaves, where, by its peculiar ornamentation, it finds excellent protection. When disturbed it has the short uncertain flight characteristic of the foregoing species. It is not common.

MELIPOTIS, Hubn.

499. **M. limbolaris,** Geyer.
Rare. Lancaster, in deep woods, E. P. V.; Ridgeway, Ont., Kilman; "Buffalo," Grote. (Can Ent. XIII, p. 91).

CATOCALA, Schrank.

500. **C. Epione,** Drury.
Buffalo, Fischer; Ridgeway, Ont., Kilman;

501. **C. lachrymosa,** Guen.
Buffalo, Fischer; Ridgeway, Ont., Kilman.

502. **C. retecta,** Grote.

503. **C. flebilis,** Grote.
Ridgeway, Ont., Kilman.

504. **C. Robinsonii,** Grote.

505. **C. obscura,** Strk.
Ridgeway, Ont., Kilman; Buffalo, Fischer, (Can. Ent. XVIII, p. 178.)

506. **C. insolabilis,** Guen.
Buffalo, Kellicott.

507. **C. residua,** Grote.
Lancaster, E. P. V.; Buffalo, Kellicott.

508. **C. relicta,** Walk.
Not common but generally distributed. Aug. to Oct.

509. **C. Amatrix,** Hubn.
Common. (See Bul. Buff. Soc. Nat. Sci. IV, p. 62).

510. **C. cara,** Guen.

511. **C. concumbens,** Walk.

512. **C. unijuga,** Walk.
Occasional. Lancaster, Aug., E. P. V.; Buffalo, Kellicott. (Can. Ent. XIII, p. 38).

513. **C. Briseis,** Edw.
Rare. August.

514. **C. parta,** Guen.
Common. July to August.

515. **C. coccinata,** Grote.
Buffalo, Fischer.

516. **C. ultronia,** Hubn.
Not uncommon on sugar, July.

517. **C. Ilia,** Cram.
Occasional. July 4th, &c.

518. **C. Ilia,** var. **Uxor,** Guen.
Buffalo, Fischer.

519. **C. cerogama,** Guen.
Common. In Can. Ent. XVII, pp. 133 & 134, Mr. Fischer has described two varieties of this species (*C. aurella* and *C. Eliza*) taken at Buffalo.

520. **C. neogama,** Abb. & Sm.
Very common everywhere.

521. **C. subnata,** Grote.
Rare. Lancaster, Aug., E. P. V.; Buffalo, Will.

522. **C. Piatrix,** Grote.

523. **C. palæogama,** Guen.

524. **C. palæogama,** var. **phalanga,** Grote.
Ridgeway, Ont., Kilman.

525. **C. habilis,** Grote.
Buffalo, Fischer; Ridgeway, Ont., Kilman.

526. **C. nebulosa,** Edw.
Buffalo, Fischer.

527. **C. antinympha,** Hubn.
Buffalo, Fischer.

528. **C. Clintoni,** Grote.
Buffalo. Fischer.

529. **C. polygama,** Guen.

530. **C. cratægi,** Saund.
Lancaster, July. Not infrequent on sugar, E. P. V.

? . **C. amasia,** Abb. & Sm.
Taken at Rochester, N. Y. and probably to be found within our limits (Can. Ent. VI, p. 25).

531. **C. similis,** Edw.
Buffalo, Kellicott.

532. **C. præclara,** G. & R.
Buffalo, Fischer; Ridgeway and Caledonia, Ont.; Kilman.

533. **C. amica,** Hubn.
Ridgeway, Ont., Kilman.

ALLOTRIA, Hubn.

534. **A. elonympha,** Hubn.
Buffalo, Fischer; Ridgway, Ont., Moffat. (Can. Ent. XII, p. 264).

PARTHENOS, Hubn.

535. **P. nubilis,** Hubn.

PHOBERIA, Hubn.

536. **P. atomaris,** Hubn.
Lancaster, May 11th 1881, one example found flying by day in a pasture, E. P. V.

PARALLELIA, Hubn.

537. **P. bistriaris,** Hubn.
Of common occurrence in or near woodland. June and July.

PANOPODA, Guen.

538. **P. carneicosta,** Guen.
Rare. Lancaster, E. P. V.

539. **P. rufimargo,** Hubn.

EREBUS, Latr.

540. **E. odora,** Linn.
Taken at rare intervals in and about this city. Buffalo and Angola, Emil Chamot; Buffalo, among bananas, Will; "Niagara Falls", Bethune. (See Can. Ent. XVIII, pp. 79 & 180; Ent. News II, p. 30).

THYSANIA, Dalm.

541. **T. Zenobia,** Cram.
Accidental. Buffalo, Emil Chamot; Ridgeway, Ont., Kilman. (Can. Ent. XXI, p. 240).

ZALE, Hubn.

542. **Z. horrida,** Hubn.
Rare. Lancaster, E. P. V.; Ridgeway, Ont., Kilman.

HOMOPTERA, Boisd.

543. **H. Edusa,** Drury.
Common. May and Aug.

544. **H. Edusa,** var. **Saundersii,** Beth.
Lancaster, E. P. V.

545. **H. Edusa,** var. **lunata,** Drury.

546. **H. minerea,** Guen.
Buffalo, Kellicott.

YPSIA, Guen.

547. **Y. undularis,** Drury.
Buffalo, Lancaster, at sugar, E. P. V.

HOMOPYRALIS, Grote.

548. **H. discalis,** Grote.
Lancaster, one example taken at light, E. P. V.

549. **H. tactus,** Grote.
Frequent at sugar and light. Aug.

SPARGOLOMA, Grote.

550. **S. sexpunctata,** Grote.
Rare. Lancaster, E. P. V.

551. **S. umbrifascia,** Grote.
Buffalo, one example, Will.

BROTIS, Hubn.

552. **B. vulneraria,** Hubn.
Accidental. Buffalo, one example taken at electric light, Fischer. (Can. Ent. XVIII, pp. 72, 136).

PSEUDAGLOSSA, Grote.

553. **P. lubricalis,** Geyer.
Very abundant on sugar and elsewhere near woodland. June and August.

554. **P. scobialis,** Grote.
"Buffalo, June and July, common", Grote. (N. Am. Ent. I, p. 95).

HELIA, Hubn.

555. **H. borealis,,** Smith.
Buffalo, Will.

EPIZEUXIS, Hubn.

556. **E. æmula,** Hubn.
Common at sugar, July.

557. **E. americalis,** Guen.
Common on sugar near the borders of woods. July and Aug.

MEGACHYTA, Grote.

558. **M. lituralis,** Hubn.
Lancaster, July, E. P. V.

LITOGNATHA, Grote.

559. **L. nubilifascia,** Grote.
Ridgeway, Ont., Kilman; "Buffalo", Grote, (Bul. Buff. Soc. Nat. Sci. I, p. 86).

CHYTOLITA, Grote.

560. **C. morbidalis,** Guen.
Very abundant in pastures and open woods, July.

ZANCLOGNATHA, Led.

561. **Z. lævigata,** Grote.
Buffalo, Kellicott.

562. **Z. ochreipennis,** Grote.
Buffalo. Kellicott and Will.

563. **Z. cruralis,** Guen.
Ridgeway, Ont., Kilman.

564. **Z. minimalis,** Grote.
Buffalo, Will.

PHILOMETRA, Grote.

565. **P. longilabris,** Grote.
Buffalo, Kellicott.

566. **P. serraticornis,** Grote.
Ridgeway, Ont., Kilman; Buffalo, Kellicott.

RIVULA, Guen.

567. **R. propinqualis,** Guen.
Lancaster, two examples taken at light and sugar, E. P. V.; Buffalo, Will.

PALTHIS, Hubn.

568. **P. angulalis,** Hubn.
Common, July.

569. **P. asopialis,** Guen.
Occurs less frequently than the preceding.

PHALENOPHANA, Grote.

570. **P. rurigena,** Grote.
Not uncommon.

RENIA, Guen.

571. **R. discoloralis,** Guen.
Buffalo, Kellicott.

572. **R. centralis,** Grote.
Buffalo, Kellicott.

573. **R. larvalis,** Grote.
Lancaster, July, E. P. V.

574. **R. flavipunctalis,** Geyer.
Buffalo, Will.

575. **R. Belfragei,** Grote.
Not uncommon in open woods.

BELEPTINA, Guen.

576. **B. caradrinalis,** Guen.
Rare. Lancaster, near woods, E. P. V.

HYPENA, Fabr.

577. **H. Baltimoralis,** Guen.
Lancaster, June, E. P. V.; Ridgeway, Ont., Kilman.

578. **H. bijugalis**, Walk.
Lancaster, E. P. V.

579. **H. abalienalis**, Walk.
Occasional. May and June.

580. **H. achatinalis**, Zell.
Lancaster, E. P. V.

581. **H. profecta**, Grote.

582. **H. deceptalis**, Walk.
Lancaster, E. P. V.

583. **H. perangulalis**, Harvey.
Ridgeway, Ont., Kilman.

584. **H. vellifera**, Grote.
Ridgeway, Ont., Kilman.

585. **H. evanidalis**, Rob.
Common.

586. **H. scabra**, Fabr.
Common everywhere.

EULINTNERIA, Grote.

587. **E. bifidalis**, Grote.
Not uncommon. May and June.

FAMILY GEOMETRIDÆ.

CHŒRODES, Guen.

588. **C. clemitaria**, Abb. & Sm.
Rare. Lancaster, E. P. V.

589. **C. transversata**, Drury.
Common. July to Sept.

TETRACIS, Guen.

590. **T. crocallata**, Guen.

591. **T. lorata**, Grote.

METANEMA, Guen.

592. **M. quercivoraria**, Guen.
Buffalo, Kellicott.

593. **M. inatomaria**, Guen.
Ridgeway, Ont., Kilman.

594. **M. carnaria**, Pack.
Not Common. Lancaster, Aug., E. P. V., and elsewhere.

CABERODES, Guen.

595. **C. confusaria**, Hubn.

ENNOMOS, Tr.

596. **E. alniaria,** Linn.
Not infrequently taken at rest on trees and fences. Sept. and Oct.

EUDALIMIA, Hubn.

597. **E. subsignaria,** Hubn.
Occasional.

SELENIA, Hubn.

598. **S. Kentaria,** G. & R.
Buffalo, Kellicott ; Ridgeway, Ont., one example of the large variety decribed by Packard on page 526 of his Monograph, taken April 29th 1890 by Mr. Kilman.

AZELINA, Guen.

599. **A. Hubnerata,** Guen.
Rare. Lancaster, June, at light, E. P. V. ; Ridgeway, Ont., Kilman.

ENDROPIA, Guen.

600. **E. serrata,** Drury.
Lancaster, Aug., at light, E. P. V.

601. **E. effectaria,** Walk.
Lancaster, E. P. V. ; Ridgeway, Ont., Kilman.

602. **E. bilinearia,** Pack.
Lancaster, E. P. V.

603. **E. textrinaria,** G. & R.
Portage Falls, May 30th 1888, E. P. V.

604. **E. marginata,** Minot.
Lancaster, one example, May, E. P. V.

605. **E. hypochraria,** H. & S.
Occasional.

606. **E. duaria,** Guen.
Lancaster, E. P. V. ; Buffalo, Will.

THERINA, Hubn.

607. **T. fervidaria,** Hubn.
Common in woods.

608. **T. seminudaria,** Walk, (= *bibularia*, G. & R.)
Buffalo, Kellicott.

METROCAMPA, Guen.

609. **M. margaritata,** Linn.
Occasional in deep woods. Aug.

ANAGOGA, Hubn.

610. **A. pulveraria,** Linn.
Ridgeway, Ont., Kilman.

SICYA, Guen.

611. **S. macularia**, Harris.
Not rare among rank vegetation in ravines at Lancaster and elsewhere. July.

ANGERONA, Dup.

612. **A. crocataria**, Fabr.
Common. July to Sept.

NEMATOCAMPA, Guen.

613. **N. filamentaria**, Guen.

PLAGODIS, Hubn.

614. **P. serinaria**, Pack.
"A series taken at Portage in May 1883, showing a gradation from the ordinary form to *P. rosaria*, G. & R.," Kellicott.

615. **P. rosaria**, G. & R.
Not infrequent. (Bul. Buff. Soc. Nat. Sci. III, p. 131).

616. **P. Keutzingaria**, Guen. var.
Ridgeway, Ont., Kilman.

617. **P. phlogosaria**, Guen.
Occasional. Lancaster, April, E. P. V.

618. **P. alcoolaria**, Guen.

HYPERETIS, Guen.

619. **H. amicaria**, H.-S.

APLODES, Guen.

620. **A. rubromarginaria**, Pack.
Rare. Lancaster, E. P. V.

621. **A. mimosaria**, Guen.
Moderately abundant. June.

SYNCHLORA, Guen.

622. **S. rubivora**, Riley.
Buffalo, Kellicott.

NEMORIA, Hubn.

623. **N. subcroceata**, Walk.
"Abundant on dunes at Pt. Abino, June 7. 1886", Kellicott.

EUCROSTIS, Hubn.

624. **E. chloroleucaria**, Guen.
A common species in open woods. Also taken at sugar and light. Aug.

DYSPTERIS, H. & S.

625. **D. abortivaria**, H.-S.
Lancaster, June, E. P. V.; Ridgeway, Ont., Kilman.

EPHYRA, Dup.

626. **E. pendulinaria,** Guen.

EUPHANESSA, Pack.

627. **E. mendica,** Walk.
Common.

ACIDALIA, Treits.

628. **A. insulsaria,** Guen.
"Buffalo", Grote. (Packard's Monog, p. 335; also Proc. Ent. Soc. Phil. I, p. 347: and Can. Ent. III, p. 103; =*persimilata*).
"Ridgeway, Ont. From pupa found spun to leaves of *Taxus*, Aug.", Kellicott.

629. **A. nivosata,** Guen.
Common in open woods and weedy copses. July.

630. **A. inductata,** Guen.
Common. Aug. and Sept.

631. **A. quadrilineata,** Guen.
Not uncommon. Lancaster, Aug. and Sept., E. P. V.

632. **A. enucleata,** Guen.

633. **A. ordinata,** Walk.
Ridgeway, Ont., Kilman.

ASTHENA, Hubn.

634. **A. lucata,** Guen.
Rare. Lancaster, E. P. V.

635. **A. albogilvaria,** Morr.
Moderately abundant.

STEGANIA, Guen.

636. **S. pustularia,** Guen.
Rather rare. Buffalo and Lancaster, E. P. V.

DEILINIA, Hubn.

637. **D. erythremaria,** Guen.
Lancaster, June 6th 1878, E. P. V.

CORYCIA, Dup.

638. **C. vestaliata,** Guen.
Common, June.

639. **C. semiclarata, var. albata,** Guen.
Ridgeway, Ont., Kilman.

EUMACARIA, Pack.

640. **E. brunnearia,** Pack.
"Buffalo, larvæ on wild red cherry", Kellicott. (See Can. Ent. XVII, p. 32).

SEMIOTHISA, Hubn.

641. **S. bisignata,** Walk.
Lancaster, May and June, E. P. V.; Buffalo, Will.

642. **S. enotata,** Guen.

643. **S. granitata,** Guen.
"Portage Falls, June," Kellicott.

PHASIANE, Dup.

644. **P. mellistrigata,** Grote.
Occasional. Lancaster, E. P. V.; "Buffalo", Grote. (Bul. Buff. Soc. Nat. Sci. I, p. 12).

MARMOPTERYX, Pack.

645. **M. strigularia,** Minot.
Ridgeway, Ont., Kilman.

THAMNONOMA, Led.

646. **T. wavaria,** Linn.
Rare. Lancaster, in deep woods, E. P. V.

647. **T. subcessaria,** Walk.
Buffalo, Kellicott; Ridgeway, Ont., Kilman.

648. **T. coortaria,** Hulst.
Lancaster, one example taken July 13th 1888, E. P. V. Kindly determined for me by Rev. Geo. D. Hulst.

LOZOGRAMMA, Steph.

649. **L. lactispargata,** Walk.
Of rare occurrence. Lancaster, E. P. V.

650. **L. detersata,** Guen.
Buffalo, Kellicott.

651. **L. defluata,** Walk.
Lancaster. June 27th 1878, E. P. V.; Buffalo, Kellicott.

EUFITCHIA, Pack.

652. **E. ribearia,** Fitch.
Abundant and somewhat injurious.

CARIPETA, Walk.

653. **C. divisata,** Walk.
Rare. Lancaster, E. P. V.; Aurora, July 12th 1890, Miss. A. M. Crawford.

FIDONIA, Tr.

654. **F. truncataria,** Walk.
Local. East Concord, May 18th 1889, not uncommon on the borders of a bog flying about low bushes of *Andromeda* and *Vaccinium*.

655. **F. notataria,** Walk.
Not uncommon around swampy spots in deep woods. May and June.

LYTHRIA, Hubn.

656. **L. chamæchrysaria,** Grote.
"Buffalo", Grote, (Bul. Buff. Soc. Nat. Sci. I, p. 13.); "Larvæ on honeylocust," Kellicott.

HÆMATOPIS, Hubn.

657. **H. grataria,** Fabr.

CATERVA, Grote.

658. **C. catenaria,** Drury.
Buffalo, Fischer and Will.

ASPILATES, Treits.

659. **A. Lintneraria,** Pack.
Ridgeway, Ont., Kilman; Buffalo, Will.

CLEORA, Curtis.

660. **C. pulchraria,** Minot.
Not uncommon on trunks of *Coniferæ.*

HEMEROPHILA, Steph.

661. **H. unitaria,** H. & S.

CYMATOPHORA, Hubn.

662. **C. umbrosaria,** Hubn.
Lancaster, Aug. 1883, one example, E. P. V.

663. **C. larvaria,** Guen.
Buffalo, Kellicott.

664. **C. humaria,** Guen.
Ridgeway, Ont., June, E. P. V.

665. **C. pampinaria,** Guen.
Common in woods. July.

666. **C. crepuscularia,** Tr.
Buffalo, Kellicott.

TEPHROSIA, Boisd.

667. **T. Canadaria,** Guen.
Buffalo, Will.

668. **T. cribrataria,** Guen.
Ridgeway, Ont., Kilman.

PARAPHIA, Guen.

669. **P. deplanaria,** Guen.
Lancaster, a single example taken in July 1882, E. P. V.

BISTON, Leach.

670. **B. ursarius,** Walk.
Rare. Lancaster, April 18th 1882 at light, also in late autumn, E. P. V.; Buffalo, Will.

EUBYJA, Hubn.

671. **E. cognataria,** Guen.
Not rare. Lancaster, larvæ on apple, E. P. V.

672. **E. quernaria,** Abb. & Sm.
Ridgeway, Ont., Kilman.

HYBERNIA, Latr.

673. **H. tiliaria,** Harris.
Quite common in late autumn flying by day in orchards and woods. Lancaster, Nov., Buffalo, Oct,, abundant at light, E. P. V.

PHIGALIA, Dup.

674. **P. strigataria,** Minot.
Lancaster and Buffalo, April, E. P. V.

OPEROPHTERA, Hubn.

675. **O. boreata,** Hubn.
This late autumnal species may be found flying about the borders of woods and copses through the month of November, and like the *Hybernia tiliaria* will brave a temperature but little above the freezing point. It is more common than its belated companion and like that species is a day-flyer.

HETEROPHLEPS, H.-S.

676. **H. Harveiata,** Pack.
Rare. Lancaster, E. P. V.

677. **H. triguttaria,** H.-S.
Common in damp woods and ravines. Aug.

BAPTRIA, Hubn.

678. **B. albovittata,** Guen.
Occasional, June.

LOBOPHORA, Curtis.

679. **L. geminata,** Grote.
Rare. Lancaster, April 10th, Concord, May 18th, E. P. V.

680. **L. anguilineata,** Grote.
Lancaster, May, taken on the wing in woods, E. P. V.

681. **L. vernata,** Pack.
Buffalo, May, E. P. V.; also taken by Prof. Kellicott at West Seneca early in April.

TRIPHOSA, Curtis.

682. **T. indubitata,** Grote.
Of rare occurrence. Lancaster, Nov. 1882; Buffalo. Nov. 21st 1890, at rest, E. P. V.

HYDRIA, Hubn.

683. **H. undulata,** Linn.
Not uncommon at light and on the wing in woods. June to Aug.

PHIBALAPTERYX, Steph.

684. **P. latirupta,** Walk.
Common. Aug.

685. **P. intestinata,** Guen.
Lancaster, Aug, 1882, one example taken, E. P. V.

ANTICLEA, Steph.

686. **A. vasaliata,** Guen.
Lancaster, June 7th 1878, E. P. V.

RHEUMAPTERA, Hubn.

687. **R. ruficillata,** Guen.
Common, June, (see Packard's Monograph, p. 153).

688. **R. intermediata,** Guen.
Buffalo, Will; Ridgeway, Ont., Kilman.

689. **R. lacustrata,** Guen.
Common at rest on barns, fences &c. and in open woods.

690. **R. unangulata,** Haw.
Lancaster, April 17th 1878, E. P. V.

691. **R. hastata,** Linn.
Infrequent. Lancaster, Aug., E. P. V.; Ridgeway, Ont., Kilman; Buffalo, Grote, (Packard's Monograph, p. 165).

OCHYRIA, Hubn.

692. **O. ferrugata,** Linn.
Ridgeway, Ont., Kilman.

693. **O. designata,** Hubn.
Of frequent occurrence with *Rheumaptera lacustrata* and *ruficillata.* May and June.

694. **O. munitata,** Hubn.
With the last but less abundant.

PETROPHORA, Hubn.

695. **P. diversilineata,** Hubn.
Common, July to Sept.

696. **P. hersiliata,** Guen.
Ridgeway, Ont., Kilman.

697. **P. truncata,** Hubn. var.
Lancaster, Sept., E. P, V.; Buffalo, Will.

HYDRIOMENA, Hubn.

698. **H. trifasciata,** Borkh.
Buffalo, June 16th 1888, E. P. V,

699. **H. traversata,** Kellicott.
One example taken at Lancaster in 1883 and evidently distinct from *trifasciata* was shown to Prof. Kellicott and by him doubtfully determined as identical with his *traversata.*

EPIRRITA, Hubn.

700. **E. perlineata,** Pack.
Occasional. Lancaster, April 20th, 1878, E. P. V.

PLEMYRIA, Hubn.

701. **P. fluviata,** Hubn.
Common. April to August.

702. **P. multiferata,** Walk.
Abundant in most localities from May to Sept.

GLAUCOPTERYX, Hubn.

703. **G. cumatilis,** G. & R.
Occasional. Lancaster, June, E. P. V.; Buffalo, Will, Grote. (See Ann. Lyc. Nat. Hist. N. Y. VIII, p. 462).

EUPETHECIA, Curtis.

704. **E. miserulata,** Grote.
Not uncommon.

705. **E. absynthiata,** Linn.
Common on trees in open woods. April and August.

FAMILY PYRALIDÆ.

ASOPIA, Treits.

706. **A. farinalis,** Linn.

707. **A. costalis,** Fabr.

708. **A. olinalis,** Guen.
Ridgeway, Ont., Kilman.

709. **A. himonialis,** Zell.
Lancaster, July, about *Phytolacca,* E. P. V.

710. **A. squamealis,** Grote.
"Buffalo," Grote. (Bul. Buff. Soc. Nat. Sci. I, p. 172; II, p. 229 and Hayden Bul. IV, p. 672).

CORDYLOPEZA, Zell.

711. **C. nigrinodis,** Zell.
"Near Buffalo," Grote, (Hayden Bul. IV, p. 673).

SCOPARIA, Haw.

712. **S. centuriella,** S. V.
Buffalo, not uncommon in 1890, E. P. V., Will, &c.

713. **S. libella,** Grote.
Moderately abundant everywhere on tree trunks, July &c.

BOTIS, Schrank.

714. **B. octomaculata,** Linn.
Ridgeway, Ont., Kilman. "Buffalo." Grote. (Hy. Bul. IV. p. 675).

715. **B. generosa,** G. & R.
Lancaster, June, E. P. V.; Buffalo, Will.

716. **B. signatalis,** Walk.
Ridgeway, Ont., Kilman.

717. **B. sumptuosalis,** Walk.
Lancaster, E. P. V.; Ridgeway, Ont., Kilman.

718. **B. Harveyana,** Grote.
Buffalo, September, at light.

719. **B. badipennis,** Grote.
Ridgeway, Ont., Kilman.

720. **B. socialis,** Grote.
Lancaster, July, larvæ on *Euonymus*, E. P. V.; Ridgeway, Ont., Kilman; Buffalo, Will. Grote. (Hy. Bul. IV, p. 678.)

721. **B. marculenta,** G. & R.
Buffalo, Will.

722. **B. submedialis,** Grote.
Ridgeway, Ont., Kilman.

723. **B. gentilis,** Grote.
Not uncommon. Sept.

724. **B. quinquelinealis,** Grote.
Buffalo, Will.

725. **B. fissalis,** Grote.
"Buffalo," Grote. (Hy. Bul. VI, p. 273).

726. **B. ditritalis,** Guen. (=*feudalis* Grote).
Buffalo, Will.

727. **B. terrealis,** Treits.
Lancaster, May, E. P. V.

728. **B. venalis**, Grote.
"Buffalo," Grote. (Can. Ent. X, p. 24, and Hy. Bul. IV, p. 680).

729. **B. illibalis**, Hubn.
Buffalo, E. P. V.; Ridgeway, Ont., Kilman.

730. **B. plectilis**, G. & R.
Lancaster, June, E. P. V.; Ridgeway, Ont., Kilman.

731. **B. adipaloides**, G. & R.
Taken occasionally by all our local collectors.

732. **B. subolivalis**, Pack.
Lancaster, at times not uncommon about *Antennaria plantaginifolia*, upon which its larvæ live, E. P. V.

733. **B. niveicilialis**, Grote.
Ridgeway, Ont., Kilman.

EURYCREON, Led.

734. **E. chortalis**, Grote.
Buffalo, Will.

NOMOPHILA, Hubn.

735. **N. noctuella**, S. V.
Common everywhere, especially about street-lamps, in Sept.

MESOGRAPHE, Hubn.

736. **M. stramentalis**, Hubn.
Not uncommon and widely distributed. June to August.

CROCIDOPHORA, Led.

737. **C. tuberculalis**, Led.
Lancaster, E. P. V.; "Buffalo," Grote (Can. Ent. X, p. 28.)

738. **C. serratissimalis**, Zell.
"Buffalo," Grote (Can. Ent. X, p. 28,; Bul. Buff. Soc. Nat. Sci. I, pp. 173–174, *subdentalis*).

PANTOGRAPHA, Led.

739. **P. limata**, G. & R.
Not common but generally distributed.

BLEPHAROMASTIX, Led.

740. **B. ranalis**, Guen.
Buffalo, Will; Ridgeway, Ont., July, Kilman.

EUDIOPTIS, Hubn.

741. **E. hyalinata**, Linn.
Buffalo, one example, Mœser.

DESMIA, Westw.

742. **D. maculalis,** Westw.
Common. July.

743. **D. subdivisalis,** Grote.
Ridgeway, Ont., Kilman.

CINDAPHIA, Led.

744. **C. bicoloralis,** Guen.
Lancaster, Aug., E. P. V.

OLIGOSTIGMA, Guen.

745. **O. albalis,** Rob.
Buffalo, Will; Squaw Isd., Niagara River, E. P. V.

HYDROCAMPA, Guen.

746. **H. genuinalis,** Led.
Lancaster, July 31st 1878, E. P. V.; Ridgeway, Ont., Kilman.

CATACLYSTA, Hubn.

747. **C. fulicalis,** Clem.
Lancaster, June, extremely abundant among willows near the creek, E. P. V.; Ridgeway, Ont., Moffat. (Can. Ent. XVII, p. 31), and elsewhere.

SALUDA, Hulst.

748. **S. asperatella,** Clem.
Ridgeway, Ont., Kilman.

ACROBASIS, Zell.

749. **A. demotella,** Grote.
Ridgeway, Ont., Kilman.

DIORYCTRIA, Zell.

750. **D. abietella,** S. V.
Buffalo, July 10th 1888, E. P. V.

PINIPESTIS, Grote.

751. **P. Zimmermani,** Grote.
Pine Hill, Cheektowaga. C. D. Zimmerman; Buffalo and Gowanda, Kellicott; See further Hy. Bul. VI, p. 589: Can. Ent. IX, p. 161: X. p. 20. XI, p. 114; and XII, p. 59; and Tr. Am. Ent.Soc. XVII, p. 137.

MEROPTERA, Grote.

752. **M. pravella,** Grote.
Lancaster, June 14th 1879, E. P. V.

ZOPHODIA, Hubn.

753. **Z. grossulariæ,** Pack. (= *Dakruma turbalella,* Grote).
Lancaster, E. P. V.

EUZOPHERA, Zell.

754. **E. semifuneralis,** Walk.
Lancaster, July 3rd, E. P. V.

VITULA, Rag.

755. **V. Edmandsii,** Pack.
Buffalo, June 13th 1888, E. P. V.

HONORA, Grote.

756. **H. oblitella,** var. *undulatella,* Clem.
"Niagara Falls", Clemens, (see Hy. Bul. IV, p. 699 and Tr. Am. Ent. Soc. XVII, p. 187).

PLODIA, Guen.

757. **P. interpunctella,** Hubn.
Common everywhere, especially about feed stores and flouring mills.

PEORIA, Rag.

758. **P. hæmatica,** Zell.
Lancaster, E. P. V.

ARGYRIA, Hubn.

759. **A. nivalis,** Drury.
Lancaster, not uncommon through July and Aug. and elsewhere, E. P. V.

CRAMBUS, Fabr.

760. **C. Girardellus,** Clem.
Ridgeway, Ont., Kilman.

761. **C. Leachellus,** Zinck.
Ridgeway, Ont., Kilman.

762. **C. agitatellus,** var. *alboclavellus,* Schl.
Ridgeway, Ont., Kilman.

763. **C. bipunctellus,** Zell.
Ridgeway, Ont., Kilman.

764. **C. laqueatellus,** Clem.
Lancaster, E. P. V.

765. **C. erinactellus,**
This name was given me many years ago by Mr. A. R. Grote for an insect taken by me at Lancaster, but, as I fail to find it in any list, it is probably the result of a clerical error on my part in copying his manuscript.

766. **C. topiarius,** Zell.
Ridgeway, Ont., Kilman.

767. **C. exsiccatus,** Zell.
Common. July and Aug.

768. **C. caliginosellus,** Clem.
Lancaster, Sept., E. P. V.

769. **C. fuscicostellus,** Zell.
Lancaster, one example, E. P. V.

770. **C. ruricollelus,** Zell.
Ridgeway, Ont., Kilman.

771. **C. vulgivagellus,** Clem.
Common. Lancaster, Buffalo, &c. Sept. Frequently taken about the city street lamps.

SCHŒNOBIUS, Dup.

772. **S. Clemensellus,** Rob.
Buffalo, Will; Ridgeway, Ont., Kilman.

GALLERIA, Fabr.

773. **G. cerella,** Linn.

NOTE.

During the printing of the present list four species of Macro-Lepidoptera have for the first time been taken within our limits and these are now added to make the list complete to date, Sept. 9th, 1891.

24½. **Phyciodes Batesii,** Reak.
Gowanda, June 24th 1891, E P. V.

68½. **Nisoniades Icelus,** Lintn.
Gowanda, June 24th 1891, E. P. V.

176½. **Isa inornata,** G. & R.
Buffalo. July 1891, Ottomar Reinecke.

332½ **Mamestra desperata,** Smith.
Buffalo. Fischer.

Index of Generic Names.

Achatodes 134
Acidalia 150
Acrobasis 158
Actias 122
Actinotia 132
Adelphagrotis 127
Adipsophanes 135
Adoneta 120
Aegeria 116
Agrotis 127
Aletia 139
Allotria 144
Alypia 116
Ampelophaga 113
Amphion 113
Anagoga 148
Anchocelis 136
Ancyloxypha 111
Angerona 149
Anisota 123
Anticlea 154
Anytus 129
Apatela 125
Apatelodes 120
Aplodes 149
Arctia 118
Argynnis 108
Argyria 159
Arsilonche 124
Asopia 155
Aspilates 152
Asthena 150
Audela 125
Azelina 148
Baptria 153
Bembecia 115
Biston 153
Blepharomastix 157
Bleptina 146
Botis 156
Brotis 145
Brotolomia 133
Bryophila 127
Caberodes 147
Callimorpha 118
Callosamia 122
Calocampa 138
Calpe 140
Caradrina 135
Caripeta 151
Carneades 129
Cataclysta 158
Caterva 152
Catocala 142
Ceratomia 114
Cerura 122
Chamyris 141
Charadra 125
Chœphora 130
Chœrodes 147
Chrysophanus 111
Chytolita 145
Chytonix 127
Cindaphia 158
Clemensia 117
Cleora 152
Clisiocampa 123
Coelodasys 121
Colias 108
Cordylopeza 156
Corycia 150
Cosmia 136
Crambodes 135
Crambus 159
Cressonia 115
Crocidophora 157
Crocigrapha 136
Crocota 117
Ctenucha 117
Cucullia 138
Cymatophora 152
Danais 108

Datana 120
Deilinia 150
Deiliphila 113
Demas 125
Desmia 158
Deva 140
Dianthœcia 130
Dilophonota 114
Dioryctria 158
Dipterygia 132
Diphthera 125
Drasteria 141
Dryocampa 123
Dyspteris 149
Eacles 123
Ecpantheria 119
Edema 121
Ellema 114
Endropia 148
Ennomos 148
Ephyra 150
Epiglæa 136
Epirrita 155
Epizeuxis 145
Erebus 144
Eubyja 153
Euchætes 119
Eucirrœdia 137
Euclea 119
Euclidia 142
Eucrostis 149
Eudalimia 148
Eudamus 112
Eudioptis 157
Eudryas 117
Eueretagrotis 127
Eufitchia 151
Euherrichia 141
Eulintueria 147
Eumacaria 150
Eupethecia 155
Euphanessa 150
Euplexia 133
Euprepia 118
Euptoieta 109
Eurycreon 157
Eustrotia 141
Euzophera 159
Fatua 115
Feltia 128
Feralia 125
Feniseca 111
Fidonia 151
Galgula 141
Galleria 160
Gastropacha 123
Glaucopteryx 155
Gluphisia 121
Gortyna 133
Grapta 109
Habrostola 139
Habrosyne 124
Hadena 131
Hæmatopis 152
Halisidota 119
Harmonia 116
Harrisimemna 126
Helia 145
Heliophila 134
Heliothis 140
Helotropha 133
Hemaris 113
Hemerophila. 152
Hepialus 124
Heteroçampa 122
Heterophleps 153
Homohadena 131
Homoptera 144
Homopyralis 145
Honora 159
Hybernia 153
Hydria 154
Hydriomena 155
Hydrocampa 158
Hypena 146
Hyperchiria 123
Hyperetis 149
Hyphantria 119
Hypoprepia 117
Hyppa 132
Ichthyura 120
Ingura 139
Isa 160
Janassa 122
Junonia 110
Laphygma 133
Leptina 124
Leucaretia 118

Limacodes 120
Limenitis 110
Lithomia 138
Lithophane 137
Litognatha 145
Lobophora . . . 153
Lophodonta 121
Lozogramma 151
Lycæna 111
Lycomorpha 117
Lygranthœcia 140
Lythria 152
Macronoctua 131
Mamestra 129, 160
Marasmalus 139
Marmopteryx 151
Megachyta 145
Melipotis 142
Melitæa 109
Meroptera 158
Mesographe 157
Metanema 147
Metrocampa 148
Microcœlia 126
Momaphana 125
Morrisonia 136
Natada 121
Nemetocampa 149
Memoria 149
Neonympha 110
Nephelodes 130
Nerice 121
Nisoniades 112, 160
Noctua 128
Nola 117
Nolaphana 135
Nomophila 157
Nonagria 134
Notodonta 121
Ochria 134
Ochyria 154
Oedemasia 121
Oligia 132
Oligostigma 158
Oncocnemis 131
Operophtera 153
Orgyia 119
Orthodes 135
Orthosia 136
Pachycerma 126
Palthis 146
Pamphila 112
Panopoda 144
Pantographa 157
Paonias 115
Papilio 107
Parallelia 144
Paraphia 152
Parastichtis 136
Parorgyia 119
Parthenos 144
Peoria 159
Peridroma 128
Perigea 132
Petrophora 154
Phalenophana 146
Phasiane 151
Pheosia 121
Phibalapteryx 154
Phigalia 153
Philampelus 113
Philometra 146
Phoberia 144
Phobetron 120
Pholisora 112
Phragmatobia 118
Phyciodes 109, 160
Pieris 108
Pinipestis 158
Plagiomimicus 140
Plagodis 149
Platagrotis 127
Platycerura 125
Platypteryx 122
Platysamia 123
Plemyria 155
Plodia 159
Plusia 139
Plusiodonta 140
Podosesia 116
Polygrammate 126
Porosagrotis 129
Prionoxystus 123
Prodenia 133
Protoparce 114
Pseudaglossa 145
Pseudothyatira 124
Pyrameis 110

Pyrophila 135
Pyrrharetia 118
Pyrrhia 140
Raphia 124
Renia 146
Rheumaptera . . . 154
Rhodophora 140
Rhynchagrotis . . . 127
Rivula 146
Saluda 158
Sannina 116
Sarrothripa 117
Satyrus 110
Scepsis 117
Schizura 121
Schœnobius 160
Sciapteron 115
Scolecocampa 135
Scoliopteryx 137
Scoparia 156
Scopelosoma 137
Selenia 148
Semiothisa 151
Semiphora 127
Seirodonta 121
Sicya 149
Smerinthus 115
Spargoloma 145
Sphida 134
Sphinx 114
Spilosoma 119
Stegania 150
Synchlora 149
Tæniocampa 135
Tarache 140
Telesilla 139
Telea 122
Tephrosia 152
Terias 108
Tetracis 147
Thamnonoma 151
Thecla 111
Therina 148
Thyatira 124
Thyreus 113
Thyris 116
Thysania 144
Tolype 123
Tricholita 131
Trigonophora 133
Triphosa 154
Triptogon 115
Trochilium 115
Utetheisa 118
Vanessa 109
Vitula 159
Xanthia 136
Xylomiges 138
Ypsia 144
Zale 144
Zanclognatha . . . 145
Zophodia 158

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A LIST OF THE HEMIPTERA

Of Buffalo and Vicinity.

By Edward P. Van Duzee.

The publication of faunal lists constitutes a very important element in the literature of entomology as in that of other branches of Natural History. They form the basis of our studies on the geographical distribution of the species and throw much light on the origin of our fauna and its relation to that of other countries and zöo-graphical regions.

But few local lists of the Hemiptera have as yet been published in this country hence the distribution of many of our species is still largely a matter of conjecture. Of the more important contributions of this character may be mentioned Dr. Harris' Catalogue of the insects of Massachusetts and Dr. Fitches' List of the Homopterous insects of the State of New York, published in 1851. Mr. Uhler's List of the Hemiptera from West of the Mississippi River can hardly be classed as a local list but it is extremely valuable for the copious notes on the distribution of many of the species then mentioned. From 1885 to 1891 M. L'Abbe Provancher published Vol. III of his Faune Entomologique du Canada; but, although a work of considerable magnitude, it has little value, owing to the many erroneous determinations it contains and its author's limited knowledge of this group of insects. Within the last few years several local lists of more or less value have appeared, devoted, in part at least, to the Hemip-

tera. These, in the order of their publication, are:—List of Hemiptera from the Muskoka Lake Region of Canada by the present writer: A List of the insects of New Jersey by Prof. J. B. Smith; Fauna Ottawaensis, Hemiptera, by Mr. W. H. Harrington; and a Catalogue of the Hemiptera of Iowa by Prof. Herbert Osborn. The latter is the most extensive and valuable local list of Hemiptera yet published in this country although Mr. Harrington's list is probably the more complete enumeration. Two other recent lists deserve notice here: Mrs. Slosson's notice of the insects taken on the summit of Mt. Washington, and Mr. Cockerell's list of insects from the sub-alpine region of Custer Co., Colorado, both of which include a few Hemiptera.

The present list enumerates all the described Hemiptera to and including the Jassoidea known to inhabit the vicinity of Buffalo, N. Y. The limit of 70 miles, adopted by Mr. David F. Day in his Catalogue of the Plants of Buffalo and Vicinity, has been followed by the author in the present list as it was in his list of our local Lepidoptera published in 1891, but nearly all the species have been captured within a radius of 20 miles from this city. Most of the material here enumerated and the notes appended are the results of the author's own labors through a period of nine years of collecting with the special object of obtaining a complete representation of our hemipterous fauna. Still many species have been added through the efforts of other local collectors and friends of the author all of which indebtedness is duly acknowledged in the annotations. But a special acknowledgement is due Mr. Alva H. Kilman of Ridgeway, Ont., who has very generously turned over to the writer all of the Hemiptera taken by him from the unusually rich collecting grounds near his home. These, as will be seen, have added largely to the value and extent of the list.

It has been deemed inadvisable to include here the *Psyllidae*, *Aphidae* and *Coccidae* as but few of our species are known and any list in these families would be extremely fragmentery. This is certainly the largest and probably the most complete local list of Hemiptera yet published in this country. In addition to the 378 species here enumerated not less than 25 species have been taken that are as yet undescribed and consequently cannot be included. These with a few forms still undetermined can be published later as a supplemental list together with such species as may be added by future collecting in this vicinity.

In the annotations the aim has been to give the known dates of capture or periods of general occurrence, the comparative abundance

of the species at this locality and any observed peculiarity of its habitat. Where a published statement exists of the occurrence of any species within our district the reference has been appended. Except in the case of a single species *(Helicoptera opaca, Say)* all the material used in the preparation of this list has been carefully examined by the author and it is believed that errors of determination have been mostly eliminated. Still should it fall far short of its intended perfection in this and other respects it is hoped it may prove of value to entomologists in general as well as to our local collectors.

CATALOGUE OF HEMIPTERA.

Suborder Heteroptera.

FAMILY SCUTELLERIDAE.

EURYGASTER, Laporte.

1. **E. alternatus,** Say.
   May to October. Widely distributed but never abundant in our district. Generally taken on swamp grasses in pastures and uncultivated fields.

CORIMELAENA, White.

2. **C. atra,** Am. and Serv.
   May to July. Common, the young may be found through July.
3. **C. nitiduloides,** Wolff.
   Rare. Colden, Aug. 1886. Ridgeway, Ont., May 30, 1891.
4. **C. pulicaria,** Germ.
   A common species everywhere throughout the season. Very abundant at times on strawberry blossoms in May, and with the young on raspberry and blackberry bushes through July and August. Also taken hibernating under boards early in April.

FAMILY CYDNIDAE.

AMNESTUS, Dallas.

5. **A. spinifrons,** Say.
   Rare. Swept from weeds in a low swampy meadow at Ridgeway Ont. in May.
6. **A. pusillus,** Uhler.
   Occasional in April and May.

CANTHOPHORUS, Muls. and Rey.

7. **C. cinctus,** Pal. Beauv.

July to Sept. May be taken in low weedy fields and along fence rows. Not common.

FAMILY PENTATOMIDAE.

PERILLUS, Stal.

8. **P. circumcinctus,** Stal.

Occurs on coarse weeds and on bushes and trees in July and August. Also taken in January hibernating in dead leaves and grass.

PODISUS, H. Sch.

9. **P. cynicus,** Say.

Occasional on willows and other trees and bushes in July, August and Sept. One specimen taken by Mr. Kilman at Ridgeway measures 20 mm. in length. I once found a large individual of this species with its beak deeply inserted in a fully grown larva of *Platysamia cecropia* which it seemed to imagine it could hold by bracing itself and pulling back with all its strength! The caterpillar did not appear at all disturbed and possibly the bug might have eaten its fill without inflicting serious injury on its victim.

10. **P. spinosus,** Dallas.

Common. May to Sept., and in January hibernating.

11. **P. modestus,** Dallas.

May to September. Sometimes abundant on trees infested with scale-insects and plant lice.

PODOPS, Laporte.

12. **P. cinctipes,** Say.

May to Sept. Swept from swamp grasses in low weedy pastures. December under leaves at the park.

BROCHYMENA, Am. and Serv.

13. **B. arborea,** Say,

Sept. Occasional on trees especially of birch. Taken hibernating early in April.

14. **B. quadripustulata,** Fabr.

July and Sept. Lancaster, on hickory and american aspen.

NEOTTIGLOSSA, Kirby.

15. **N. undata,** Say.

May to Sept.

COSMOPEPLA, Stal.

16. **C. carnifex,** Fabr.

Generally abundant everywhere throughout the season but like the next they seem especially fond of the mullen. I once observed a remarkable gathering of these pretty insects on a wild columbine at Ridgeway Ont., on the 31st of May. They were present in such number as nearly to cover the plants and were pairing, which was apparently the object of the meeting.

MORMIDEA, Am. and Serv.

17. **M. lugens,** Fabr.

May to Sept. Common on mullens.

EUCHISTUS, Dallas.

18. **E. fissilis,** Uhler.

Common from May to Oct. When pairing in May they, like many other Hemiptera, are covered with a white bloom.

19. **E. servus,** Say.

May to Oct. A more southern form quite rare here.

20. **E. tristigmus,** Say.

Abundant everywhere in trees, bushes and coarse weeds from May to Sept.

21. **E. variolarius,** Pal. Beauv.

Occurs here from April to November, but in early summer when *fissilis* and *servus* are most abundant this is rarely seen. Late in autumn it frequently appears in large numbers and may be found resting on the trunks of maple and elm trees on our city streets, sometimes when the weather is fine, as late as the last of November. I have even found it when there was snow on the ground, as is the case with the squash-bug, *Anasa tristis*. *E. variolarius* is a relentless foe to the *Pulvinaria innumerabilis* and with the *Chrysopa* larvae do much to keep this pest of the maple in check.

22. **E. ictericus,** Linn.

June to Sept. Generally rare but taken in numbers at Cheektowaga, June 26, 1893, on a low swampy meadow.

COENUS, Dallas.

23. **C. delius,** Say.

Common in dry fields and pastures throughout the season. In September last I found a dozen or more individuals gathered on a bruised sweet apple, the juice of which they were eagerly imbibing.

PENTATOMA, Oliv.

24. **P. juniperina,** Linn.

Occasional on various trees and bushes especially willows and junipers. May to Oct. Young in July and August.

PERIBALUS, Muls.

25. **P. limbolarius,** Stal

July to Sept. Rather scarce.

THYANTA, Stal.

26. **T. custator,** Fabr.

One nymph taken in April 1887 transformed to an imago on May 1. Very rare here.

NEZARA, Am. and Serv.

27. **N. hilaris**, Say.
This large handsome species is not uncommon on various trees where the larvæ may be found in July and August. They reach maturity about Sept. 1.

BANASA, Stal.

28. **B. dimidiata**, Say.
Rare. August and Sept. On birch and other trees.

29. **B. calva**, Say.
Common on cedar everywhere. June to Sept. A beautiful insect when fully colored.

ACANTHOSOMA, Curtis.

30. **A. cruciata**, Say.
Ridgeway, Ont., one example taken by Mr. Kilman.

FAMILY CORIIDÆ.

ANASA, Am. and Serv.

31. **A. tristis**, DeGeer. The "Squash-bug."
A common and injurious insect. Frequently found on warm sunny days in late autumn resting on fences and outbuildings about which it hibernates.

ALYDUS, Fabr.

32. **A. eurinus**, Say.
Common in dry fields in July and about flowers of the golden-rod later in the season. Frequently taken immature in June. These insects have the quick jerky flight of many wasps for which they might easily be mistaken.

33. **A. conspersus**, Montd.
Occurs with *eurinus* but is somewhat the more abundant form here. This recently described species may be distinguished from *eurinus* by its dotted membrane and generally paler colors.

34. **A. quinquespinosus**, Say.
Rare. Taken at Niagara Falls about Aug. 1, by Mr. Kilman.

PROTENOR, Stal.

35. **P. Belfragei**, Hagl.
Occasional. Lancaster; several swept from rank grass near a spring in August. Fort Erie, Ont., July 4, 1891, immature.

NEIDES, Latr.

36. **N. muticus**, Say.
Common in weedy fields and pastures. The summer brood appears about Aug. 1. Taken in winter hibernating.

JALYSUS, Stal.

37. **J. spinosus**, Say.
Lancaster, one example swept from a swampy meadow, August 1887.

CORIZUS, Fallen.

38. **C. punctiventris,** Dallas.
May to August. Common.

39. **C. nigristernum,** Sign.
May to Oct. Abundant in fields and pastures. Reaches maturity about June 15.

FAMILY LYGÆIDÆ.

NYSIUS, Dallas.

40. **N. thymi,** Wolff.
May to August.

ORSILLACIS, Uhler.

41. **O. producta,** Uhler.
June to Sept., common. The characters of this genus and species seem never to have been published,

BELONOCHILUS, Uhler.

42. **B. numenius,** Say.
Rare. Buffalo May 12, 1889. Colden, August 1886, on golden-rod.

ISCHNORHYNCHUS, Fieb.

43. **I. didymus,** Zett.
Common throughout the summer. It appears on the wing on warm days early in April and is one of the last to resort to its hibernaculum on the approach of winter.

CYMUS, Hahn.

44. **C. augustatus,** Stal.
May to Oct. Very abundant everywhere in damp fields and pastures especially on the various species of *Carex* on which the young subsist. Taken in moss in January. (See Psyche Vol. V, p. 27.)

45. **C. claviculus,** Fallen.
With the preceding, but less abundant.

46. **C. sp.?**
One example, closely allied to *luridus* if not a variety of that species, occurred while sweeping weeds at South Buffalo, August 2, 1886.

BLISSUS, Burm.

47. **B. leucopterus,** Say. The "Chinche-bug."
Very abundant in dry hay fields and pastures, at times doing serious injury, but not yet found on the cultivated cereals here. It hibernates in moss and rubbish and may be found active from early spring till late autumn. (See Can. Ent. XVIII, p. 209.)

GEOCORIS, Fallen.

48. **G. borealis,** Dallas.
Rather rare. Buffalo, September, taken in moss, Ridgeway, Ont., July.

49. **G. limbatus,** Stal.
June to August. Moderately abundant on damp spots in meadows and grain fields.

OEDANCALA, Am. and Serv.

50. **O. dorsalis,** Say.
May to August. Common, especially on sedges in swampy pastures. Young in July. (See *Psyche V, p. 27.*)

CROPHIUS, Stal.

51. **C. disconotus,** Say.
Rare. Colden, one example swept from golden-rod August 14, 1886. I once took it in numbers on golden-rod at Kinzua Bridge, Pa., in Sept.

LIGYROCORIS, Stal.

52. **L. sylvestris,** Linn.
June to Sept. Common.

53. **L. constrictus,** Say.
Rare. Hamburgh, August 3. 1890. Ridgeway, Ont., July. Clarence, Sept., 4, 1892.

MYODOCHA, Latr.

54. **M. serripes,** Oliv.
Buffalo, June, one example found in a basket of strawberries. May have been brought from Ohio.

HERAEUS, Stal.

55. **H. plebejus,** Stal.
Rare. Lancaster, Sept. Elma, June. Also found concealed in moss in January.

PAMERA, Say.

56. **P. basalis,** Dallas.
Taken occasionally from May to August.

CNEMODUS, H. Sch.

57. **C. mavortius.**
Two examples, swept from grass at Lancaster in Oct. 1885.

SALACIA, Stal.

58. **S. pilosula,** Stal.
May and Sept. Taken at Buffalo, Lancaster and Ridgeway Ont. Also sifted from moss in January.

TRAPEZONOTUS, Fieb.

59. **T. nebulosus,** Fallen.
Rare. September.

PERITRECHUS, Fieb.

60. **P. fraternus,** Uhler.

One example from Ridgeway, Ont., and another from Buffalo; found in December hibernating in dead leaves, by M. C. Van-Duzee.

SCOLOPOSTETHUS, Fieb.

61. **S. Thomsoni,** Reut.

May to Aug. Not uncommon among moss and rubbish in fence rows. The long and short winged forms occur together as with *Blissus leucopterus*, with which it may be found in winter hibernating. Young in July.

EREMOCORIS, Fieb.

62. **E. ferus,** Say.

Rare. Colden, July; Jamestown, August.

MICROTOMA, Lap.

63. **M. atrata,** Goeze. (*M. carbonaria, Rossi.*)

Two examples were picked up on the Lake Shore at Crystal Beach after a storm, May 30, 1891.

MEGALONOTUS, Fieb.

64. **M. unus,** Say.

Lancaster, Sept. 3, 1888, and one example, swept from weeds at South Buffalo, by Mr. Ph. Fischer of this city.

65. — ———

A small Lygæid as yet undetermined was captured by me at Crystal Beach, Ont., in May 1891 and several other specimens were taken by Mr. Ph. Fischer under a stone, March 30, 1894.

PELIOPELTA, Uhler.

66. **P. abbreviata,** Uhler.

Common throughout the season and may frequently be taken by sifting moss and leaves in winter. The short winged form is much the more abundant here.

LYGAEUS, Fabr.

67. **L. Kalmii,** Stal.

Very abundant on milk-weeds, especially in Sept. and Oct.

68. **L. turcicus,** Fabr.

A single example of this more southern form was taken at Lancaster, by W. J. Palmer, Jr.

FAMILY CAPSIDÆ.

A partial list of our local Capsidæ appeared in the Canadian Entomologist for April 1887, to which reference may be made for additional notes on some of the species here enumerated.

BRACHYTROPIS, Fieb.

69. **B. calcarata,** Fallen.

TRIGONOTYLUS, Fieb.

70. **T. ruficornis,** Fallen.
June to August.

MIRIS, Fabr.

71. **M. affinis,** Reut.
Swept from grass early in May. The summer brood reach maturity about the middle of June and are sometimes very abundant through July and August.

LEPTOPTERNA, Fieb.

72. **L. dolobrata,** Linn.
Often appears in immense swarms toward the last of June on grass in hay-fields and pastures.

COLLARIA, Prov.

73. **C. Meilleurii,** Prov.
Common.

74. **C. oculatus,** Reut.
Rather rare. June to August.

TERATOCORIS, Fieb.

75. **T. discolor,** Uhler
Buffalo. August 29, 1888.

RESTHENIA, Spinola.

76. **R. insitiva,** Say.
Rare.

77. **R. insignis,** Say.
Colden, July 31, 1889, one example.

LOPIDEA, Uhler.

78. **L. media,** Say.

79. **L. confluenta,** Say.
Lancaster, June, on basswood.

DIOMMATUS, Uhler.

80. **D. congrex,** Uhler,
Common. June to Aug. (See *Ent. Am.* III, p. 33.)

HADRONEMA, Uhler.

81. **H. pulverulenta,** Uhler.
Occasional. Lancaster, May and July. Colden, August.

PHYTOCORIS, Fabr.

82. **P. eximus,** Reut.
June to August.

83. **P. tibialis,** Reut.

84. **P. puella,** Reut.
Buffalo, Aug. 18, 1888. One example. A very delicate and pretty species.

85. **P pallidicornis,** Reut.
A large species, rare here but more abundant northwardly.

86. **P. scrupeus,** Say.
Not uncommon on bladder-nut.

87. **P. colon,** Say.
A rare and interesting species. June to Aug. Taken on dog-wood July 10, &c.

NEUROCOLPUS, Reut.

88. **N. nubilus,** Say.
On Sumach. Common.

CALOCORIS, Fieb.

89. **C. rapidus.**
Very common.

MELINNA, Uhler.

90. **M. fasciata,** Uhler.
Rare. Buffalo; July, beaten from Hickory bushes.

91. **M. modesta,** Uhler.
July and August. Not uncommon on pines and a few other trees when infested with aphides (See *Ent. Am.* III, p. 69.)

LYGUS, Hahn.

92. **L. pabulinus,** Linn.

93. **L. pratensis,** Linn.
May to Oct. Common.

94. **L. pratensis,** var. **flavomaculatus,** Prov.
May to Oct., very abundant. Also taken in winter hibernating.

95. **L. invitus,** Say.
Common.

96. **L. monachus,** Uhler.
Rare.

COCOBAPHES, Uhler.

97. **C. sanguinarius,** Uhler.
July and Aug. Occasional on maple and other trees.

TROPIDOSTEPTES, Uhler,

98. **T. cardinalis,** Uhler.
Rare. Lancaster, taken with the young on ash in June. Elma, June 18.

POECILOSCYTUS, Fieb.

99. **P. basalis,** Reut.
Very common, especially in weedy meadows.

POECILOCAPSUS, Reut.

100. **P. lineatus,** Fabr.
Common on wild sun-flowers and other weeds. Reaches maturity about the middle of June.

101. **P. goniphorus,** Say.
Reaches maturity about a week earlier than *lineatus*.

102. **P. goniphorus,** var. F. Reut.
Much less abundant than *marginalis*, which it much resembles. May to July.

103. **P. goniphorus,** var. **dislocatus,** Say.
Not uncommon at times.

104. **P. affinis,** Reut.
June and July. Rare.

105. **P. marginalis,** Reut.
June and July. Moderately common.

SYSTRATIOTUS, Doug. and Scott.

106. **S. americanus,** Reut.
June to August. About rank weeds.

CAMPTOBROCHIS, Fieb.

107. **C. nebulosus,** Uhler.
July and Aug. On trees, rather rare.

108. **C. grandis,** Uhler.
June to August. Not uncommon. Occasionally taken at light.

ORTHOPS, Fieb.

109. **O. scutellatus,** Uhler.
Rare.

110. **O. pastinacæ,** Fall. ?
Common on flowers of the Umbelliferæ, from May to August. It may frequently be found in winter hibernating under the loose bark of elms and other trees; then the scutellum is often of a bright clear green.

CAPSUS, Fabr.

111. **C. ater,** Linn.
Attains maturity about first week in June.

MONALOCORIS, Dall.

112. **M. filicis,** Linn.

SERICOPHANES, Reut.

113. **S. ocellatus,** Reut.
Rare. June.

HYALIODES, Reut.

114. **H. vitripennis,** Say.
Rare. Colden, July; Salamanca, August. A beautiful species.

STHENAROPS, Uhler.

115. **S. malinus,** Uhler.
Lancaster, July. Not rare on rank weeds near the creek.

ILNACORA, Reut.

116. **I. Stalii,** Reut.
July and Aug. Occasional, with the last.

PILOPHORUS, Hahn.

117. **P. amœmus,** Uhler.
July and August. Common on pine trees infested with aphides.

118. **P. bifasciatus,** Fabr.
June to August.

119. **P. Walshii,** Uhler.
Buffalo, one example.

MIMOCEPS, Uhler.

120. **M. gracilis,** Uhler.
Occasionally swept from sedges and grasses in low meadows and pastures. June to Sept.
(See Trans. Md. Acad. Sci. I, p. 85, 1890.)

GARGANUS, Stal.

121. **G. fusiformis,** Say.
July and August. Not uncommon.

STIPHROSOMA, Fieb.

122. **S. stygica,** Say.

HALTICUS, Burm.

123. **H. bractatus,** Say.

124. **H. apterus,** Linn.
June and July. Common.

IDOLOCORIS, Doug. and Scott.

125. **I. famelicus,** Uhler.

126. **I. agilis,** Uhler.

MACROCOLEUS, Fieb.

127. **M. coagulatus,** Uhler.

STRONGYLOTES, Reut.

128. **S. saliens,** Reut.
June.

RHINOCAPSUS, Uhler.

129. **R. Vanduzei,** Uhler.
June and July. Rare. Taken at Buffalo, Lancaster and Colden. This pretty species reaches maturity early in July.
(See Trans. Md. Acad. Sci. I, p. 82, 1890.)

PSALLUS, Fieb.

130. **P. variabilis,** Illig.
Taken in numbers at Lancaster in Aug. 1887.

EPISCOPUS, Reut.

131. **E. ornatus,** Reut.
Rare. Two examples captured at West Seneca in July.

PLAGIOGNATHUS, Fieb.

132. **P. obscurus**, Uhler.
Very abundant here on ox-eye daisies and other flowers from June to Sept.

133. **P. Bohemani**, Illig.
June to Aug. Beaten in large numbers from a willow bush at Lancaster June 28, 1889.

AGALLIASTES, Fieb.

134. **A. associatus**, Uhler.

135. **A. pulicarius**, Fallen.

136. **A. verbasci**, H. Sch.

FAMILY ACANTHIIDÆ.

LYCTOCORIS, Hahn.

137. **L. domesticus**, Schill.
Rare. Lancaster.

DOLICHOMERUS, Reut.

138. **D. Stalii**, Reut.
Lancaster, one example taken under loose bark in January by Mr. W. J. Palmer, Jr.

TRIPHLEPS, Fieb.

139. **T. insidiosus**, Say.
Very abundant from June to Sept. on flowers of ox-eye daisies and other compositæ.

140. **T. latulus**, Reut.
Several individuals taken at Jamestown, Aug. 2d, 1889 and one at Lancaster in July. These, especially the Lancaster specimen, have the corium almost entirely pale but otherwise agree very closely with Reuter's description.

ANTHOCORIS, Fallen.

141. **A. musculus**, Say.
Occasionally taken on the trunks of black willow trees and about osier bushes. This insect is sometimes very active in the bright July sunshine about the trees that form its home. Also taken in February hibernating.

ACANTHIA, Fabr.

142. **A. lectularia**, Linn.
The ubiquitous bed-bug.

FAMILY TINGITIDÆ.

PIESMA, St. Farg. and Serv.

143. **P. cinerea**, Say.
Inhabits horsechestnut trees under the loose bark of which it may sometimes be taken in winter.

ACALYPTA, Westw.

144. **A. sp.**

One example of an apparently undescribed species of this genus was taken by me at Ridgeway, Ont., May 31st, 1886.

CORYTHUCA, Stal.

145. **C. ciliata,** Say.

Abundant everywhere on sycamore. In winter they may be looked for under the loose bark on the north-east side of these trees. The insects of this genus are beautiful objects under a lense.

146. **C. arquata,** Say. (=**C. juglandis,** Fitch?)

July to Sept. Common. I cannot satisfactorily separate the small form that sometimes abounds on the under surface of osier leaves from the larger form occurring on various trees. Both present individuals without the elytral spines, and I cannot make out any constant variation in the form of the scutellar carina as mentioned by Dr. Stal, nor of the arquation of the elytral costa used by Dr. Fitch to seperate his species from that of Say.

If this species is divisible I do not think the salient characters have as yet been pointed out.

147. **C. sp.**

Not uncommon on oaks from May to Sept.

148. **C. marmorata,** Uhler.

July to Sept. A pretty little species, sometimes quite abundant on bushes in clearings.

GARGAPHIA, Stal.

149. **G. tiliæ,** Walsh.

Abundant on basswood in July.

FAMILY ARADIDÆ.

(A list of the North American species of this family, by Dr. Bergroth, appeared in the Trans. Ent. Soc. of Wash., Vol. II, pp. 332–338, Dec. 1892.)

ARADUS, Fabr.

(Dr. Bergroth has kindly determined my material in this difficult genus but as the specimens have not yet been returned, I can give but few dates. The localities are from his notes and are correct.)

150. **A. 4-lineatus,** Say.

Lancaster, N. Y. and Ridgeway, Ont.

151. **A. robustus,** Uhler.

Colden, East Concord. The latter were taken near the bog swamp, May 18th, 1889.

152. **A. Duzei**, Berg.
Ridgeway, Ont. (See Trans. Ent. Soc. Wash. II, p. 333.)

153. **A. similis**, Say.
Lancaster.

154. **A. crenatus**, Say.
Ridgeway, Ont. Two of these Ridgeway species were among the material kindly given me by Mr. Kilman but without the specimens I cannot locate them.

155. **A. lugubris**, Fallen. (=*rectus*, Say.)
Ridgeway, Ont., Buffalo, on a window in June. Hamburgh, Aug., Colden July 1886. At the latter locality several individuals appeared on the trunk of a small maple tree about 5 o'clock every afternoon. They were very active, leaping and sporting about in the rays of the declining sun as flies of the Tachinidæ frequently do. The reflection of the sunlight from their white glassy wings made these little black bugs look like drops of silver as they darted from point to point, and their activity made it next to impossible to capture them or even to trace them with the eye.

156. **A. abbas**, Berg.
Colden. (See Trans. Ent. Soc. Wash. II, p. 334.)

ANEURUS, Curtis.

157. **A. inconstans**, Uhler.
Taken under dead birch bark in all stages of development, from February to April.

FAMILY PHYMATIDÆ.

PHYMATA, Latr.

158. **P. fasciata**, Gray. (=*Wolffii*, *Stal*,=*erosa*, *Auct.*)
July to Oct. Common, especially on flowers of the golden-rod.

FAMILY NABIDÆ.

PAGASA, Stal.

159. **P. nitida**, Stal.
One specimen taken from under a rotting log at Lancaster, July 12, 1889.

CORISCUS, Schranck.

160. **C. subcoleoptratus**, Kirby.
Common everywhere from July to Sept. The young in their earlier stages quite strongly resemble our common black ants and may be found in similar situations on golden-rod and other weeds and bushes. They reach maturity about July 1st but here rarely acquire wings. A single macropterous example occurred to me while sweeping weeds near "the ledges" at Buffalo Park, June 25, 1887.

161. **C annulatus,** Reut.

Rare. At Lancaster it occurred in numbers on rank vegetation along Cayuga Creek, in Aug. 1887.

162. **C. rufusculus,** Reut.

May to Sept. Not uncommon.

163. **C. ferus,** Linn.

Abundant from June to Oct. in meadows and pastures, in company with *rufusculus* and *punctipes*. These insects must hibernate as adults, as I have taken both this species and the next as early as the first week of May.

164. **C. punctipes,** Reut.

May to Sept. Common. Occurs with *ferus* but seems to prefer damper and more weedy meadows.

165. **C. propinquus,** Reut.

Not uncommon in places on the reeds and water grasses on Squaw Isd. and along the shores of Niagara River below Black Rock, from July to Sept. Occasionally taken on swampy meadows elsewhere.

FAMILY REDUVIDÆ.

SINEA, Am. and Serv.

166. **S. diadema,** Fabr.

Common on trees, bushes and coarse weeds from July till late autumn. The odd looking young may be found in June.

ACHOLLA, Stal.

167. **A. multispinosa,** De Geer.

July to Oct. Generally much less abundant than the preceding, but at one time taken in large numbers from an old oak tree, near Lancaster, in July.

PRIONIDUS, Uhler.

168. **P. cristatus,** Linn.

Probably an accidental visitor. A single example was taken in a lumber yard in this city in Sept. 1885 and presented to me by Dr. Julius Pohlman. It may have been introduced with lumber from the South.

DIPLODUS, Am. and Serv.

169. **D. luridus,** Stal.

Not uncommon on small trees in May and June. They reach maturity about June 1st.

OPSICŒTUS, Klug.

170. **O. personatus,** Linn.

Frequently taken about houses, often at light in the evening. The young has the peculiar habit of covering itself with dust so it is well concealed in the corners it inhabits. This insect feeds on vermine and is a desirable tenant of our living rooms and offices.

BARCE, Stal.

171. **B. annulipes,** Stal.

Ridgeway, Ont., Aug. 6, 1887, one example.

CERASCOPUS, Heinek.

172. **C. errabundus**, Say.
Rare. Lancaster and Ridgeway, Ont., on pine trees in August.

FAMILY HYDROBATIDÆ.

HYGROTRECHUS, Stal.

173. **H. remigis**, Say.
Rare. Colden, July 1885.

LIMNOTRECHUS, Stal.

174. **L. marginatus**, Say.
July to Sept. Common everywhere on running water. I have taken the young of this species during July and the adult in January.

LIMNOPORUS, Stal.

175. **L. rufoscutellatus**, Latr.
Another common species, especially on stagnant water in ponds and ditches.

FAMILY VELIIDÆ.

HEBRUS, Curtis.

176. **H. americanus**, Uhler.
Sometimes quite abundant on the surface of the water and on wet slaty rocks in the gorge of Pipe Creek near West Falls, Erie Co., in July and August. It could doubtless be found in similar cool shaded ravines elsewhere in our district. This is an active species and very difficult to capture. The fully winged examples are rarely taken here.

177. **H. pusillus**, Burm.
A few specimens of this neat little species were taken on the moist sand among rushes along the edge of Cayuga Creek, at Lancaster Village, July 12th, 1889.

MESOVELIA, Muls.

178. **M. bisignata**, Uhler.
September. Taken with the nymphs in "The Bay" at the upper end of Squaw Isd., Niagara River. Very few macropterous examples were seen.

RHAGOVELIA, Mayr.

178½. **R. obesa**, Uhler.
Taken by Mr. Frank H. Zesch from a small pool on the borders of Niagara River above the rapids, at Dufferin Island, near Chippewa, Ont., Aug. 15, 1894. They were present in numbers and very active, skipping about on the surface of the water.

FAMILY SALDIDÆ.

SALDA, Fabr.

179. **S. ligata**, Say.
Taken occasionally along the shores of Lake Erie and Niagara River, from July to Sept.

180. **S. littoralis,** Linn.

Thus far taken here only in the gorge of Pipe Creek, near West Falls, in July.

181. **S. deplanata,** Uhler.

A single example of this large species was taken Aug. 2d, 1886, in a swale, by the railroad track at South Buffalo.

182. **S. interstitialis,** Say.

Several specimens of what I take to be this species were captured on the borders of Niagara River, near Buffalo, in Sept. 1886.

183. **S. pallipes,** Fabr.

Abundant from June to Sept. on the shores of Lake Erie and along our inland streams.

184. **S. reperta,** Uhler. ?

Several examples of a little species agreeing very closely with Mr. Uhler's description of *reperta* were captured at Colden, in July, and at Buffalo the last of August.

185. **S. orbiculata,** Uhler.

Rare, one specimen taken near Buffalo, in 1885.

186. **S. humilis,** Say.

Not uncommon on low swampy spots in pastures and open woods where the water has dried away, leaving the ground bare and moist. May to July.

FAMILY BELOSTOMATIDÆ.

ZAITHA, Am. and Serv.

187. **Z. fluminea,** Say.

Quite abundant in Black Rock Harbor in Sept.

BELOSTOMA, Auctor.

188. **B. americanum,** Leidy.

Rare.

BENACUS, Stal.

189. **B. griseus,** Say.

April to Sept. Frequently attracted to the electric lights on our city streets, where its large size makes it an object of interest.

FAMILY NEPIDÆ.

RANATRA, Fabr.

190. **R. fusca,** Pal. Beauv.

Rare. A small colony of these curious insects was discovered in a ditch near the "Sinking Bridge" at East Aurora, Oct. 24th, 1891, by Miss T. Marion Schlegel. It may inhabit similar situations elsewhere in our district.

191. **R. quadridentata,** Stal.

A larger and paler species, three individuals of which have occurred to me in fifteen years collecting here. One was taken among rubbish in Cayuga Creek at Lancaster, another on aquatic weeds at "the Bay" at the upper end of Squaw Isd. Niagara River, in Sept. 1886; the third was picked up on the sand at Fort Erie Beach, July 9th, 1893, after a storm.

NOTONECTA, Linn.

192. **N. insulata,** Kirby.

Taken in ponds at Buffalo Plains, in July. It is not uncommon everywhere in stagnant pools, where there is a clayey bottom and the water does not entirely dry away in summer.

193. **N. undulata,** Say.

This is a smaller and more abundant species than the preceding with which it may be found through July and August. It is very variable in the extent of its dark markings.

194. **N. irrorata,** Uhler.

Not infrequent in stagnant muddy pools with *insulata* and *undulata*. July.

FAMILY CORISIDÆ.

CORISA, Groff.

195. **C. alternata,** Say.

Common in Niagara River and in most of the creeks about Buffalo. July and August.

196. **C. Harrisii,** Uhler.

Quite abundant in a pond at Ridgeway, Ont. in Aug. 1886.

197. **C. ———**

Excessively abundant in the waters of Lake Erie, Niagara River and especially in the Harbor at Black Rock, in Sept. Also common in many ponds and small streams. I have seen this species flying in swarms along the White's Corner's plank-road at South Buffalo about dusk in the evening.

Suborder Homoptera.

FAMILY CICADIDÆ.

CICADA, Linn.

198. **C. canicularis,** Harris

The shrill note of this common Harvest-fly, often called "the Locust," is a familiar sound through the heat of the day in July and August. Though most abundant about open sunny woods they are frequently heard in our shaded city streets and at the Park where the empty pupa-cases may often be found clinging to the bark of the trees.

NOTE:—*Tibicen rimosa,* Say, should occur here and I once found at North Collins an empty pupa-case quite different from that of *canicularis*, and a Cicada's note, strange to me, was heard at the same locality so I have little doubt but this species inhabits the hills of N. Collins and probably elsewhere in our district.

FAMILY MEMBRACIDÆ.

Subfamily Membracina, Stal.

ENCHENOPA, Am. and Serv.

109. **E. binotata**, Say.
A common species on thistles and other weeds in July.

CAMPYLENCHIA, Stal.

200. **C. curvata**, Fabr.
Common everywhere.

Subfamily Smiliina, Stal.

CERESA, Am. and Serv.

201. **C. diceros**, Say.
July to Sept. Common on elder bushes.

202. **C. bubalus**, Fabr.
June to Aug. Not uncommon on grape vines and various bushes and trees. I have included under this name only the large bright green form with sharp thoracic horns. The smaller dark hairy form with short abrupt horns is the following:

203. **C. taurina**, Fitch.
Occurs on Willows in swampy places. At Lime Lake, Aug. 2, 1887 I took a large series of this species showing a wide variation in depth of coloring, some of the males being almost entirely piceous black. I am in some doubt as to the correctness of this determination.

204. **C. brevicornis**, Fitch.
July to Oct. Widely distributed but never abundant. This species seems partial to basswood.

STICTOCEPHALA, Stal.

205. **S. inermis**, Fabr.
July and August. Not a common species.

206. **S. lutea**, Walk.
May to Sept. Abundant. Generally taken in the sweep-net from weedy fields and fence-rows.

ACUTALIS, Fairm.

207. **A. dorsalis**, Fitch.
Occurs on Clematis virginiana in July and Aug., sometimes in numbers.

ENTYLIA, Germ.

208. **E. bactriana**, Germ.
May to Sept. Abundant everywhere on weeds especially wild sunflowers. *E. sinuata*, Fabr. I have not taken here nor have I seen examples from farther north than the vicinity of New York City.

PUBLILIA, Stal.

209. **P. concava,** Say.

May to August. Common on thistles, asters and other weeds. These insects attain maturity about June 15th.

210. **P. nigridorsum,** Godg.

Occasional with the preceding. East Concord, May 18, 1889, Hamburgh, June 10, 1891, Lancaster, Aug. 11, 1891. (See Bnl. Ill. State Lab. Nat. Hist. III, p. 399.)

CYRTOLOBUS, Godg.

(=CYRTOSIA, Fitch, preoc.)

211. **C. vau,** Say.

Rare. Ridgeway, Ont. A. H. Kilman.

212. **C. inornata,** Say.

Ridgeway, Ont., A. H. Kilman. Formerly I applied this name to the female of *Atymna castaneæ.* (See Psyche V, pp. 389 and 391) but the present species agrees much better, in form at least, with Say's description.

ATYMNA, Stal.

213. **A. castaneæ,** Fitch.

June to Aug. On chestnut trees, everywhere, sometimes abundant. The females are much larger than the males and of a clear green color.

214. **A. querci,** Fitch.

On oak trees, rare. Ridgeway, Ont., June, Niagara Falls, August. In this species the females are pale greenish yellow with a more convex dorsum than the males.

215. **A. inermis,** Emmons.

Rare. Colden, August; Salamanca, Aug. 2, 1889, Hamburgh, July 16, 1893, on basswood, recently moulted.

OPHIDERMA, Fairm.

216. **O. salamandra,** Fairm.

Ridgeway, Ont., June 15, 1889. Common on oak, imagines just appearing, Ft. Erie Beach, July 1893. Rare.

217. **O ———**

Lancaster, one example.

CARYNOTA, Fitch.

218. **C. mera,** Say.

Lives on hickory, sometimes quite abundant in July and Aug.

TELAMONA, Fitch.

219. **T. reclivata,** Fitch.

July and Aug. Frequent on Basswood. Hamburgh, July 16, 1893, imagines taken in company with the young.

220. **T. monticola,** Fabr.

Rare. Buffalo and Lancaster in July. Ridgeway, Ont.

221. **T. ampelopsidis,** Harris.
July and August. On Virginia Creeper, sometimes abundant.

222. **T. coryli,** Fitch.
Lancaster, July 4th, 1879. Ridgeway, Ont.

223. **T. fasciata,** Fitch.
Occasional on hickory. Ridgeway, Ont., Aug. 7, 1889, Colden, July 2, 1893, scarcely mature. I have included *T. unicolor* Fitch, as the female of this species. (See Psyche V, p. 391.)

224. **T. concava,** Fitch.
Rare. Lewiston, July 20 1892. Ridgeway, Ont.

HELIRIA, Stal.

225. **H. scalaris,** Fairm.
Lancaster, July 1887, one example.

THELIA, Am. and Serv.

226. **T. bimaculata,** Fabr.
Rare. Buffalo Plains on locust. Ph. Fischer.

227. **T. Uhleri,** Stal.
Ridgeway, Ont., one example, A. H. Kilman.

228. **T. acuminata,** Fabr.
Colden and Lancaster in July, Ridgeway, Ont.

229. **T. cratægi,** Fitch.
Rare. Lancaster, on thorn bushes.

230. **T. univittata,** Harris.
Rare. Gowanda, June 25, 1891.

231. **T. Godingi,** Van D.
June and July numbers taken on wild black cherry and scrub oak at Buffalo Plains.

ARCHASIA, Stal.

232. **A. galeata,** Fabr.
Buffalo. Not uncommon on low oak and hickory bushes at "The Plains" in July.

233. **A. Belfragei,** Stal.
Gowanda, June 25, 1891. Three examples beaten from oak bushes on the "Four Mile Level."

Subfamily Centrotida, Stal.

MICROCENTRUS, Stal.

234. **M. caryæ,** Fitch.
August. On hickory trees, sometimes quite abundant.

FAMILY FULGORIDÆ.

Subfamily Dictyopharida, Stal.

SCOLOPS, Schaum.

235. **S. sulcipes,** Say.
Rather rare. Lancaster in August. Larvæ taken July 9th.

Subfamily Cixiida, Stal.

CIXIUS, Latr.

230. **C. stigmatus,** Say.
Rare. Ridgeway, Ont., May 31, 1886; Colden in July, Lewiston, July 20.

237. **C. colœpium,** Fitch.
May and June. Frequently taken in the sweep-net in weedy meadows.

238. **C. pini,** Fitch.
Lime Lake, Aug. 3, 1886. Very abundant on huckleberry bushes. Also taken at Lewiston and elsewhere in July. (Can. Ent. XXI, p. 7.)

OLIARUS, Stal.

239. **O. quinquelineatus,** Say.
May to July. Taken occasionally on low bushes and weeds.

240. **O. humilis,** Say.
July to Sept. Often abundant on grass in dry pastures and meadows.

MYNDUS, Stal.

241. **M. impunctatus,** Fitch.
July. Rare.

Subfamily Delphacida, Stal.

MEGAMELUS, Fieb.

242. **M. piceus,** Van D.
Aug. and Sept. Taken at Lancaster, Clarence and Grand Isd., on low damp meadows.

PISSONOTUS, Van D.

243. **P. marginatus,** Van D.
One pair taken at Lancaster in September.

244. **P. ater,** Van D.
A single female example was taken near the Bedell House, on Grand Isd., Sept. 11, 1892.

245. **P. basalis,** Van D.
Lancaster, July 4, 1888, one macropterous example.

246. **P. dorsalis,** Van D.
Lancaster and Colden, one pair taken in July.

247. **P. brunneus,** Van D.
Several specimens have been taken at Clarence and Grand Isd. in September.

248. **P. aphidioides,** Van D.
Colden, July, "Rock City" near Salamanca, Aug. 2, 1889.

STENOCRANUS, Fieb.

249. **S. dorsalis,** Fitch.
Rather common in swampy places about sedges, the perigynia of which it closely mimics especially in the larval state. These insects reach maturity in August and may be taken by sweeping the grasses about their haunts till October, and again in the spring. (Psyche V, p. 28.)

KELISIA, Fieb.

250. **K. axialis,** Van D.
Rare. Two specimens swept from grass in a low meadow at Lancaster in Aug. 1886.

EURYSA, Fieb.

251. **E. nervata,** Van D.
A stout little insect not uncommon in meadows in June and July.

CONOMELUS, Fieb. ?

252. **C. tricarinatus,** Say.
Rare. Lancaster, Aug. 1887.

LIBURNIA, Stal.

253. **L. ornata,** Stal.
A single example of this pretty little species was swept from a hay field near the Jammerthal quarries at Buffalo Plains, June 9, 1888.

254. **L. pellucida,** Fabr.
May to Aug. Common everywhere especially among wild strawberry vines.

255. **L. puella,** Van D.
Rare. Lancaster, Aug. 1887. More abundant southward.

256. **L. furcata,** Prov. ?

257. **L. Osborni,** Van D.

258. **L. lutulenta,** Van D.
Common. May to July.

259. **L. obscurella,** Boh.
East Concord, May 18, 1889. Colden, July 31, 1889.

260. **L. lateralis,** Van D.
Lancaster. Aug. and Sept. Not a common species.

261. **L. Kilmani,** Van D.
A very pretty species occasionally taken in damp rich copses. Elma, June: Colden, July.

262. **L. campestris,** Van D.
May to August. Very abundant in dry pastures, where Ox-eye daisies abound, in July and August.

263. **L. lineatipes,** Van D.
July and Aug. Not uncommon in dry fields.

264. **L. foveata**, Van D.
Portage Falls, May 30th; Lancaster, Aug.; Clarence, Sept.

265. **L. incerta**, Van D.
Buffalo and Cheektowaga; on grass in June

ACHOROTILE, Fieb.

266. **A. albosignata**, Dahlb.
Buffalo, May 11, 1888. Rare. East Concord, May 18, 1889, abundant in a swampy field.

Subfamily Achilida, *Stal.*

HELICOPTERA, Am. and Serv.

267. **H. opaca**, Say.
I include this species on the authority of its describer and Mr. P. R. Uhler. Say says: "inhabits near Lake Erie" which Mr. Uhler still further localizes as "New York near Lake Erie" so it doubtless occurs within our limits.

Subfamily Derbida, *Stal.*

OTIOCERUS, Kirby.

268. **O. Degeerii**, Kirby.
Not uncommon, July to Sept. Generally taken on beech and maple trees. (Can. Ent. XXI, p. 159.)

269. **O. Stollii**, Kirby.
One example beaten from oak at Buffalo Plains, Aug. 18, 1888. (Can. Ent. XXI, p. 159.)

270. **O. Coquerbertii**, Kirby.
Not uncommon on various forest trees July to Sept. (Can. Ent. XXI, p. 159.)

271. **O. Wolfii**, Kirby.
Lancaster, Sept. 3, 1888. One example beaten from a beech tree. (Can. Ent. XXI, p. 176.)

272. **O. Signoreti**, Fitch.
Rare. Lancaster, Sept. 14, 1888. Two examples taken. (Can. Ent. XXI, p. 176.)

AMALOPOTA, Van D.

273. **A. Uhleri**, Van D.
A beautiful little species several examples of which were taken by myself and Mr. W. J. Palmer Jr. at Lancaster in Sept. 1888, mostly from maple trees. (Can. Ent. XXI, p. 178.)

274. **A. Fitchi**, Van D.
One specimen of this delicate little beauty was beaten by me from a hickory tree among the hills west of Colden village, Aug. 28, 1892. Can. Ent. XXV, p. 280.)

LAMENIA, Stal.

275. **L. vulgaris,** Fitch.
Common everywhere from June to August on willow, thorn, beech and other trees and bushes.

Subfamily Issida, Stal.

BRUCHOMORPHA, Newm.

276. **B. oculata,** Newm.
Occasional on grass and weeds in August.

PELTONOTUS, Muls.

277. **P. histrionicus,** Stal.
Lancaster, Sept. 3, 1888, taken in numbers in a weedy pasture overgrown with sedges. Not seen elsewhere in our district.

THIONEA, Stal.

278. **T. bullata,** Say.
Ridgeway, Ont., three examples taken by Mr. A. H. Kilman.

Subfamily Flatida, Stal.

ORMENIS, Stal.

279. **O. pruinosa,** Say.
Taken occasionally on basswood, ash and other low trees and bushes in August.

FAMILY CERCOPIDÆ.

Subfamily Aphrophorida, Stal.

LEPYRONIA, Am. and Serv.

280. **L. 4-angularis,** Say.
July and Aug. Not uncommon.

APHROPHORA, Germ.

281. **A. parallela,** Say.
Common on pines at Ridgeway, Ont. in Aug and occasionally taken wherever the white pine grows. Also taken on hemlocks at Lancaster and Colden in July and Aug.

282. **A. saratogensis,** Fitch.
Rare. Beaten from pines at Water Valley, near Hamburgh, Aug. 3, 1890 and at the cemetery at Salamanca, Aug. 2, 1889.

283. **A. 4-notata,** Say.
Common about bushes and weeds, especially in deep woods. July and August.

CLASTOPTERA, Germ.

284. **C. obtusa,** Say.
Common on weeds and bushes in July and August and occasional throughout the season.

285. **C. achatina,** Germ.
Colden, Aug. 1886, one example.

286. **C. proteus,** Fitch.
July and Aug. Not common. Taken in large numbers on *Cornus stolonifera* at Lancaster, July 22, 1889.

Superfamily Jassoidea, Van D.

FAMILY ULOPIDÆ.

ULOPA. Fallen.

287. **U. canadensis,** Van D.
Rare. Ridgeway, Ont., A. H. Kilman; Grand Isd., near the Bedell House in Oct. 1892, Clarence in Sept. (Trans. Am. Ent. Soc. XIX, p. 301.)

FAMILY BYTHOSCOPIDÆ.

IDIOCERUS, Lewis.

288. **I. pallidus,** Fitch.
July and Aug. Common on willows especially *Salix nigra.* Also taken on poplars.

289. **I. suturalis,** Fitch.
July and Aug. Occurs with the last, but is less abundant.

290. **I. nervatus,** Van D.
Lancaster, June 28, 1889, one example.

291. **I. alternatus,** Fitch.
Not uncommon on willows especially *Salix glauca.* May to August.

292. **I. lachrymalis,** Fitch.
Very rare here. One example was taken by Mr. W. J. Palmer Jr. at Lancaster and another by myself at Hamburgh, July 16, 1893 on *Populus grandidentatus.*

293. **I. cratægi,** Van D.
Not rare on thorn bushes in July and August. This is a very active little insect and difficult to capture when beating over an umbrella. (Can. Ent. XXII, p. 110.)

294. **I. maculipennis,** Fitch.
July and August. On thorn bushes. Of rare occurrence.

295. **I. Pronancheri,** Van D.
A beautiful little insect taken occasionally from May to Aug. on various low bushes but generally near oak or hickory. (Can. Ent. XXII, p. 111.)

BYTHOSCOPUS, Germ.

296. **B. variabilis,** Fitch.
Occurs rarely on birch trees from May to July. (Ent. Am. VI, p. 223.)

297. **B. distinctus,** Van D.

July and Aug. Rather rare. Taken on *Populus grandidentatus* at Buffalo Plains, July 10, 1889: also at Lancaster, Hamburgh, &c. (Ent. Am. VI, p. 224.)

298. **B. cognatus,** Van D.

One pale individual of this northern species was captured at Lancaster, May 31, 1887. (Ent. Am. VI, p. 227.)

299. **B. fenestratus,** Fitch.

Rare. In my synopsis of this genus I failed to properly distinguish between this species and *minor*. Most of the material there enumerated under *fenestratus* should have been refered to *minor*. (Ent. Am. VI, p. 225.)

300. **B. minor,** Fitch.

Frequently abundant on birch, iron-wood, &c. June to Aug. (Ent. Am. VI, p. 225.)

301. **B. pruni,** Prov.

One specimen taken near this city. (Ent. Am. VI, p. 226.)

302. **B. sobrius,** Walk.

Many examples were beaten from a birch tree at Colden, July 2, 1893 and a single female was taken at Lancaster, May 31, 1887. (Ent. Am. VI, p. 224.)

303. **B. nigrinasi,** Fitch.

June to August. Abundant everywhere on hornbeam. (Ent. Am. VI, p. 228.)

PEDIOPSIS, Burm.

304. **P. viridis,** Fitch.

Another common species occuring on willows from June to Aug., and occasionally found on poplars. (Ent. Am. V, p. 170 and Psyche V, p. 239.)

305. **P. basalis,** Van D.

This rare species occured in numbers on low aspen bushes along the shore of Lake Erie, west of Ft. Erie Beach, July 10 to 20, 1893.

306. **P. trimaculata,** Fitch.

Rare. Gowanda, June 24, 1891; Hamburgh, July 16, 1893, on *Populus grandidentatus;* Colden, July, one brachypterus example. (Ent. Am. V, p. 172.)

307. **P. canadensis,** Van D.

One example beaten from a willow bush at Lancaster, June 27, 1889. (Ent. Am. V, p. 173, *flavescens*, and Can. Ent. XXII, p. 111.)

308. **P. insignis,** Van D.

Many specimens were beaten from a small bush of wild plum at Lancaster, July 9, 1889. (Ent. Am. V, p. 171.)

AGALLIA, Curtis.

309. **A. novella**, Say.
Common, especially early in summer. May to July.

310. **A. sanguinolenta**, Prov.
June to Sept. Common in fields everywhere. (Ent. Am. V, p. 166.)

311. **A. 4-punctata**, Prov.
May to August with the foregoing species, sometimes very abundant. (Ent. Am. V, p. 167.)

FAMILY TETTIGONIDÆ.

Subfamily Tettigoniina, Berg.

TETTIGONIA, Geoff.

312. **T. hieroglyphica**, Say.
Locally abundant. Portage Falls, May 30th; Lancaster, Sept. 3, in a swampy meadow.

313. **T. bifida**, Say
Sometimes quite abundant on a fine matted *Juncus* growing in open swampy woods and along streams, July and Aug.

DIEDROCEPHALA, Spin.

314. **D. coccinea**, Forst.
Common through July and Aug., especially on blackberry bushes.

315. **D. mollipes**, Say.
May to Aug. Very common in damp meadows.

316. **D. mollipes**, var. **producta**, Walk.
With the last of which it is probably but a variety. Under this name I have placed the smaller dark form with a blackish lateral vitta beneath.

317. **D. novæboracensis**, Fitch.
Locally abundant on damp or marshy meadows in July and August. It may be found in great numbers on Squaw Isd., Niagara River.

HELOCHARA, Fitch.

318. **H. communis**, Fitch.
Very abundant in swampy spots and on grass among willows along the borders of ditches and streams, from May till Sept. Pairing takes place toward the last of June when the males are thickly covered with a white bloom.

EUCANTHUS, Lep. and Serv.

319. **E. orbitalis**, Fitch.
Rare. Taken at Lancaster in July and August.

Subfamily Gyponina, Stal.

GYPONA, Germ.

320. **G. 8-lineata,** Say.
Of this beautiful species I have taken but one male and two female examples; all at Lancaster.

321. **G. flavilineata,** Fitch (=*striata*, Burm?)
Under this name I place the large pale form with the elytra reticulated only at apex. It is quite abundant on various plants and trees through July and Aug.

322. **G. quebecensis,** Prov.
This is a smaller, darker green species with the elytra reticulated almost to base. I have taken it only on hemlocks, from July to Sept.

323. **G. scarlatina,** Fitch.
Occasional on hickory trees through July and Aug.

PENTHIMIA, Germ.

324. **P. americana,** Fitch.
Occurs rarely on hickory, maple and other trees from May to July. Occasionally it may be beaten from low bushes in deep woods and along their borders. The male was described by Walker as *vicaria*.

FAMILY JASSIDÆ.

Subfamily Acocephalina, Van D.

STRONGYLOCEPHALUS, Flor.

325. **S. agrestis,** Fallen.
One example was swept from a swampy meadow at East Concord, May 18, 1889.

ACOCEPHALUS, Germ.

326. **A. mixtus,** Say.
Not uncommon on thin fine grass in old meadows and along roadsides and fence-rows where the ground is bedded with moss among which the males are most frequently taken. The females seem to wander farther and may sometimes be captured in the sweep-net. Many males were taken under stones along the roadside at Lewiston in July 1892.

XESTOCEPHALUS, Van D.

327. **X. pulicarius,** Van D.
Sometimes abundant in dry meadows from July to Sept.

328. **X. fulvocapitatus,** Van D.
Occurs occasionally with the preceding of which it may be but a variety. It is larger, with a fulvous head and the elytra are more coarsely maculated.

Subfamily Jassina, Van D.

TRIBE DORYDINI, Van D.

PARABOLOCRATUS, Fieb.

329. **P. viridis**, Uhler.

Moderately abundant in May and June, on grass in meadows, where the vegetation grows rank and thick. Occasionally taken as late as July.

PARAMESUS, Fieb,

330. **P. vitellinus**, Fitch.

A rather rare species occurring on witch hazel, poplar and probably other trees from June to Aug.

TRIBE DELTOCEPHALINI, Van D.

PLATYMETOPIUS, Burm.

331. **P. acutus**, Say.

Common on grass and weeds from June to Sept. Generally they reach maturity about the middle of June or a little later.

332. **P. frontalis**, Van D.

With the preceding but much less abundant. June to Sept. I have taken this most frequently among oak bushes at Park side in this city. (Can. Ent. XXII, p. 112.)

DELTOCEPHALUS, Burm.

333. **D. configuratus**, Uhler.

A common meadow insect from May to Aug., probably injurious in hay fields.

334. **D. Osborni**, Van D.

Rare. Five examples of this large species were swept from sedges in a low pasture at Lancaster, Sept 3, 1888. (Trans. Am. Ent. Soc. XIX, p. 304.)

335. **D. Melscheimeri**, Fitch.

May to July. Common. Of this species I have gathered my two hands level full from the sweep-net, taken in a single turn of about fifty yards. This was from a dry meadow near Buffalo Park in June 1889. Considering the small size of the insect, this means an astonishing number of individuals.

336. **D. Sayi**, Fitch.

A common little insect everywhere in dry meadows from May to July.

337. **D. debilis**, Uhler.

June and July. Not uncommon among rank grass in low meadows. In this species the disc of the corium is frequently more or less covered by a blackish cloud and there may be another on the clavus and the membrane is often blackish. It is very near the european *D. abdominalis*, Fabr.

338. **D. iminicus,** Say.
Abundant in hay-fields throughout the season.

339. **D. nigrifrons,** Forbes.
Rare. Lancaster, June and Aug. 1887.

TRIBE ATHYSANINI, Van D.

ATHYSANUS, Burm.

340. **A. obsoletus,** Kirsch.
Rare, Lancaster, July 4th, 1888, three examples.

341. **A. extrusus,** Van D.
Portage Falls. May 30th, 1888. (Can. Ent. XXV, p. 283.

342. **A. plutonius,** Uhler.
Occasional, June to Sept.

343. **A. Curtisii,** Fitch.
Not uncommon in dry fields and orchards from June to Sept.

EUTETTIX, Van D.

344. **E. seminuda,** Say.
Frequently beaten from bushes and low trees in August. Taken in June at Lancaster and in October at Buffalo on wild black cherry.

PHLEPSIUS, Fieb.

345. **P. irroratus,** Say.
June to Oct. Common on bushes and trees. (Trans. Am. Ent. Soc. XIX, p. 71.)

346. **P. incisus,** Van. D.
With the preceding, but rare. Buffalo, Lancaster and Ridgeway, Ont. July and Aug. (Trans. Am. Ent. Soc. XIX, p. 73.)

347. **P. humidus,** Van D.
Not uncommon in damp situations. July and August. Taken in numbers on *Sagittaria* and *Polygonum* along the railway ditches at South Buffalo. Aug. 2, 1889. (Trans. Am. Ent. Soc. XIX, p. 76.)

348. **P. fulvidorsum,** Fitch.
July and August. Rare. Taken at Colden and Lancaster on hemlock bushes and at Salamanca on pine. (Trans. Am. Ent. Soc. XIX, p. 74.)

SCAPHOIDEUS, Uhler.

349. **S. immistus,** Say.
Common in damp fields everywhere. Most frequently taken on witch hazel and other bushes, July to Sept.

350. **S. lobatus,** Van D.
Rare. Lancaster, Sept. 7, 1888, W. J. Palmer, Jr.

351. **S. auronitens,** Prov.
Lancaster, July and August, rather rare.

352. **S. jucundus,** Uhler.
One example taken at Lancaster in August.

THAMNOTETTIX, Zett.

353. **T. clitellaria,** Say.
Sometimes quite abundant on various kinds of vegetation through June and July, and occurs more rarely throughout the season.

354. **T. Kennicotti,** Uhler.
Not infrequently taken on oak and hickory bushes at Buffalo Plains and elsewhere, June to Sept.

355. **T. melanogaster,** Prov.
July to Sept. Occasional on rank grass in moist situations.

356. **T. inornata,** Van D.
Taken at Lancaster with the preceding in July and August. (Trans. Am. Ent. Soc. XIX, p. 303.)

357. **T. Fitchi,** Van D.
July and Aug. In meadows; rather rare. Fort Erie, Ont., and Colden, N. Y. (Ent. Am. VI, p. 133.)

358. **T. perpunctata,** Van D.
Rare here, but more abundant southward. Taken at Buffalo and Lancaster in Aug.

LIMOTETTIX, J. Sahlbg.

359. **L. striola,** Fall.
July to Sept. Locally abundant in damp meadows. Found in great numbers at the bog-swamp near Clarence.

CHLOROTETTIX, Van D.

360. **C. unicolor,** Fitch.
June to August. Common on low willows in swampy fields.

361. **C. tergata,** Fitch.
Inhabits swampy meadows, where Carices abound, sometimes in considerable numbers. July and August. (Psyche VI, p. 309.)

JASSUS, Fabr. (Stal.)

362. **J. olitorius,** Say.
Occasional on hickory, basswood and other low trees and bushes in Aug. and Sept.

CICADULA, Zett.

363. **C. variata,** Fall.
Lancaster, June to Sept., at times not uncommon. Taken at Lime Lake, Aug. 3, 1886.

364. **C. Slossoni,** Van D.
A single example of this pretty little species was taken by me at Lancaster, July 12, 1889. (Can. Ent. XXV, p. 281.)

365. **C. punctifrons,** Fall.
One example taken with the last.

366. **C.punctifrons,** var **americana,** Van D.
Abundant on low willows, June to Aug. (Can. Ent. XXIII, p. 169.)

GNATHODUS, Fieb.

367. **G. punctatus,** Thumbg.
Common throughout the season but more abundant in earl spring on the fresh green grass of damp meadows.

Subfamily Typhlocybina.

GENUS ALEBRA, Fieb.

368. **A. aurea,** Walsh.
Lancaster, June to August. Rare.

GENUS EMPOASCA, Walsh.

369. **E. albopicta,** Forbes.
Lancaster; Abundant on weeds in fence-rows in———— May 1886; taken also in Aug. and Sept. on Apple and other trees.

GENUS KYBOS, Fieb.

370. **K. smaragdula,** Fall.
This european species occurred in great numbers on weeping birch at "The Front" in this city from June to Sept. 1889.

GENUS TYPHLOCYBA, Germ.

371. **T.vitis,** Harris.
Lancaster, May, not common.

372. **T. vitifex,** Fitch.
Common everywhere on grape vines, from May to Sept.; also taken hibernating under bark, in April.

373. **T. comes,** Say.
Rare.

374. **T. affinis,** Fitch.
Lancaster, Aug. 10, 1886, on wild grape.

375. **T. obliqua,** Say.
Not uncommon on wild grape vines from May to Sept.

376. **T. tricincta,** Fitch.
Lancaster, Rare; taken from under bark in January by Mr. W. J. Palmer, Jr.

377. **T. vulnerata,** Fitch.
Lancaster, Aug. Also taken in April hibernating under the bark of hickory trees.

378. **T. trifasciata,** Say.
Lancaster &c. June and July, rather rare.

379. **T. querci**, Fitch.

A single specimen taken at Lancaster, July 24, 1889.

380. **T. rosæ**, Harris.

Very abundant and destructive on rose bushes, June to Sept. In a large number taken on the 8th of Sept. 1887, the females outnumbered the males as ten to one.

(NOTE: Seven other species of the typhlocybina have been taken within our territory which appear to be still undescribed.)

NOTE.

During the publication of this list one species has been added and two others determined so it now includes 381 species representing 195 genera. Of these 123 genera and 198 species belong to the suborder Heteroptera and 72 genera and 183 species to the Homoptera.

INDEX TO THE GENERA.

Acalypta . . . 181
Acanthia . . 180
Acanthosoma . 172
Acholla . . . 183
Achorotile . . . 192
Acocephalus . 197
Acutalis . . . 187
Agallia . . . 196
Agalliastes . . 180
Alebra . . . 201
Alydus 172
Amalopota . . 192
Amnestus . . . 169
Anasa 172
Aneurus . . . 182
Anthocoris . . . 180
Aphrophora . . 193
Aradus 181
Archasia . . . 189
Athysanus . . . 199
Atymna . . . 188

Banasa 172
Barce 183
Belonochilus . . 173
Belostoma . . 185
Benacus . . . 185
Blissus . . . 173
Brachytropis . . 175
Brochymena . . 170
Bruchomorpha . 193
Bythoscopus . . 194

Calocoris . . . 177
Camptobrochis . 178
Campylenchia . 187
Canthophorus . . 170
Capsus 178
Carynota . . 188
Cerascopus . . 184
Ceresa 187
Chlorotettix . . 200
Cicada 186
Cicadula . . . 200
Cixius 190
Clastoptera . . 193
Cnemodus . . . 174
Coccobaphes . 177
Coenus 171
Collaria . . . 176
Conomelus . . 191
Corimelæna . . 169
Corisa 186
Coriscus . . . 182
Corizus . . . 173
Corythuca . . . 181
Cosmopepla . . 170
Crophius . . . 174
Cymus 173
Cyrtolobus . . . 188

Deltocephalus . 198
Diedrocephala . 196
Diommatus . . 176
Diplodus . . . 183
Dolichomerus . 180

Empoasca . . . 201
Enchenopa . . 187
Entylia 187
Episcopus . . 179
Eremocoris . . 175
Eucanthus . . 196
Euchistus . . . 171
Eurygaster . . . 169
Eurysa . . . 191
Eutettix . . . 199

Garganus . . . 179
Gargaphia . . . 181
Geocoris . . . 174
Gnathodus . . . 201
Gypona . . . 197

Hadronema . . 176
Halticus . . . 179
Hebrus 184
Helicoptera . . 192
Heliria 189
Helochara . . 196
Heræus 174
Hyaliodes . . 178
Hygrotrechus . . 184

Idiocerus . . . 194
Idolocoris . . 179
Ilnacora . . . 179
Ischnorhynchus . 173

Jalysus . . . 172
Jassus 200

Kelisia . . . 191
Kybos 201

Lamenia . . . 193
Leptopterna . . 176
Lepyronia . . 193
Liburnia . . . 191
Ligyrocoris . . 174
Limnoporus . . 184
Limnotrechus . 184
Limotettix . . 200
Lopidea . . . 176
Lyctocoris . . 180
Lygæus . . 175
Lygus 177

Macrocoleus . . 179
Megalonotus . 175
Megamelus . . 190
Melinna . . 177
Mesovelia . . 184
Microcentrus . 189
Microtoma . . 175
Mimoceps . . 179
Miris 176
Monalocoris . 178
Mormidea . . 171

Myndus . . . 190
Myodocha . . 174

Neides . . . 172
Neottiglossa . 170
Neurocolpus . 177
Nezara . . . 172
Notonecta . . 186
Nysius . . . 173

Oedancala . . 174
Oliarus . . 190
Ophiderma . . 188
Opsicœtus . . 183
Ormenis . . . 193
Orsillacis . . . 173
Orthops . . . 178
Otiocerus . . . 192

Pagasa . . . 182
Pamera . . . 174
Parabolocratus . 198
Paramesus . . 198
Pediopsis . . . 195
Peliopelta . . 175
Peltonotus . . . 193
Pentatoma . . 171
Penthimia . . 197
Peribalus . . 171
Perillus . . . 170
Peritrechus . . 175
Phlepsius . . . 199
Phymata . . 182
Phytocoris . . 176
Piesma . . . 180
Pilophorus . . 179
Pissonotus . . . 190
Plagiognathus . 180
Platymetopius . 198
Podisus . . . 170
Podops 170
Pœcilocapsus . 177
Pœciloscytus . . 177
Prionidus . . . 183
Protenor . . 172
Psallus 179
Publilia . . . 188

Ranatra . . . 185
Resthenia . . 176
Rhinocapsus . . 179
Rhagovelia . . 184

Salacia 174
Salda 184
Scaphoideus . . 199
Scolopostethus . 175
Scolops 189
Sericophanes . 178
Sinea 183
Stenocranus . 191
Sthenarops . . 178
Stictocephala . 187
Stiphrosoma . . 179
Strongylocephalus 197
Strongylotes . 179
Systratiotus . . 178

Telamona . . . 188
Teratocoris . . 176
Tettigonia . . . 196
Thamnotettix . 200
Thelia 189
Thionea . . . 193
Thyanta . . . 171
Trapezonotus . 174
Trigonotylus . . 176
Triphleps . . 180
Tropidosteptes . 177
Typhlocyba . 201

Ulopa 194

Xestocephalus . 197

Zaitha 185

Descriptions of some new North American Homopterous Insects

By E. P. VAN DUZEE, Buffalo, N. Y.

1. IDIOCERUS, NERVATUS, n. sp.

Small, Pale green, sometimes paler and tinged with yellow beneath especially on the face. Pronotum in clearly marked examples showing three longitudinal pale vittæ. Basal angles of the scutellum with a blackish spot mostly covered by the pronotum which is there discolored. Elytra hyaline with the nervures very indistinct; the costal, and sometimes one of the discal, pale greenish. Wings hyaline, iridescent, with strong brown nervures which are visible through the elytra as oblique brown lines. Tergum and at times the femora tinged with yellow. Tibiæ and tarsi green with brown spines. Length 4-4½ mm.

The front is broader in this species than in *pallidus*, its nearest ally, with its sides more oblique and the apex of the clypeus less abruptly expanded. Two last ventral segments of the female of nearly equal length, the ultimate a very little subangularly advanced at the middle, the edge either side nearly rectilinear to the rounded lateral angles. Its form is thus very similar to that of *amœmus*. In the males the slender plates are much shorter than in *pallidus*, extending for only about two thirds the length of the pygofers.

N. Y., N. J., Mich. Described from one male and four female examples: One pair taken by me at Lancaster, N. Y. June 28th, 1889; a female taken in New York City by Mr. E. B. Southwick, another taken at Anglesea, N. J. May 28th, by Prof. J. B. Smith and one from Agricultural College Mich., received from Mr. G. C. Davis.

This species may be recognized by its small size, green color, the dusky basal angles of the scutellum, and the brown nervures of the wings which are plainly visible through the hyaline elytra. This may be the *Bythoscopus obsoletus* of Walker but it is impossible to decide without an examination of his type.

2. PLATYMETOPIUS LORICATUS n. sp.

Small. Dark brown varied with whitish, face entirely pale yellow. Last ventral segment of the male angularly excavated, valve broadly rounded behind. Length, 4 mm.

Vertex well produced, subacute, twice as long on the middle as next the eye, the edges before the eyes feebly convexly arquated, the hind edge almost angularly excavated. Front unusually narrow, the clypeus a little

expanded at apex. Plates of the male about as long as the valve, triangular, apex acute, the sides a little concavely arcuated and fringed with pale stiff bristles.

Color dark brown tinged with reddish, irrorated and reticulated with pale, vertex with a short white median line at tip and a few longitudinal yellowish dashes forming an angulated broken transverse band before the eyes. Pronotum with five obscure pale longitudinal vittæ. Scutellum paler, varied with yellow on the middle. Elytra spotted with yellowish along its sutural nervure, the costa broadly whitish and crossed by numerous oblique brown veinlets, the disc minutely reticulated with pale along the nervures and marked by about a dozen round white dots in the areoles a few of which are larger. Wings faintly enfumed, iridescent, with strong brown nervures. Face entirely yellow, the front very faintly clouded and minutely irrorated with paler and showing an obsolete pale angular mark at base. Breast and venter nearly black, pruinose, the disc of the plates pale. Femora edged and dotted with pale, the tibæ pale dotted with brown.

California. Described from four male examples received Mr. D. W. Coquillett. This is a smaller and darker species than *acutus* with the plates and valve much shorter and the face entirely pale yellow. P. *frontalis* has a shorter vertex, the outer margins of the cheeks are brown and the form of the genitalia is quite different.

3. PLATYMETOPIUS FUSCIFRONS n. sp.

Brown, finely irrorated with pale. Elytra white reticulated with brown, face entirely fulvous-brown minutely irrorated with pale, basal angles of the scutellum orange-fulvous. Vertex shorter and more obtuse than in the preceding species; hind edge but feebly arcuated between the eyes. Pronotum with an obscure slender pale median line. Scutellum tinged with fulvous and marked with an orange-fulvous spot, edged with fuscous, with the basal angles, the outer edge at base and the apex white. Elytra white the nervures and a few reticulations within the areoles, sometimes coalescing, brown; Costal area crossed by about ten oblique brown veinlets: commissural nervure yellowish.

Front broader than in the preceding species, the edges a little sinuated, clypeus contracted on the middle. Face brown, minutely dotted with paler, marked with a pale line behind the eyes and an angular mark on the base of the front. Pleural pieces pale brown more or less invaded with fuscous on their disc. Tergum blackish with a pale margin; venter brown irrorated with paler. Valve of the male large, sinuated on the sides, the apex broadly rounded, Plates broad and short, but slightly exceeding the valve, rounded at apex. Pygofers considerably surpassing the plates, obtuse. Last ventral segment of the female short, of nearly equal length across its whole width, feebly sinuated on the middle, with an obsolete median keel below, pygofers stout, obtuse, a little exceeded by the oviduct. Length 4½ mm.

Arizona. Described from one male and two female examples received from the Morrison Collection at Cornell University. These came labelled *P. albopunctatus*, Fitch, but that is a very distinct species inhabiting the United States east of the Rocky Mountains and now known as *P. frontalis*, Van D.

4. ALLYGUS COSTOMACULATUS, n. sp.

Form nearly of *Jassus jucundus*, Uhl. Cinerous; elytra irregularly inscribed and marked with four brown costal spots. Length 6 mm.

Head rather tumid, broadly rounded before. Vertex nearly flat, but little longer on the middle than next the eye. Front rather narrow, the sides but feebly arcuated. Clypeus but little expanded apically. Cheeks narrow, scarcely surpassing the loræ, outer angles rounded. Last ventral segment of the female feebly produced on the middle of the apical margin, outer angles rounded; pygofers slender, scarcely exceeded by the oviduct.

Color cinerous tinged with testaceous and clouded with the same color on the discal areoles of the elytra. Vertex whitish before, marked with two brown points at the tip and another above each ocellus; face testaceous; front with about six brown arcs and a brown basal line, sometimes obscure; two points on the disc of the cheeks and the antennal pits brown or blackish. Legs and beneath soiled white with some brown areas on the pleural pieces; two bands on the femora, the tips of the tarsal joints and a row of dots at the base of the tibial spines on the posterior pair, piceous. Abdomen testaceous, an irregular cloud on the base of the venter and the middle of the ultimate segment brown; disc of the tergum blackish either side of the middle. Pronotum irrorate with darker with a row of brown points on the anterior submargin. Elytra sparcely inscribed with brown pigment lines as in *Phlepsius* omitting most of the costal region; disc of the clavus with a brown oblique band, costa with four brown spots three of which are near the apex; nervures brown, the outer branch of the first sector bearing an elongated white spot just beyond the first costal brown point. Wings white iridescent, nervures heavy, brown.

Described from two females received from Prof. Herbert Osborn and labelled "Texas Aaron."

5. DELTOCEPHALUS, FUSCINERVOSUS, n. sp.

Form of *D. flavocostatus*. Brown, varied with pale and black, elytral areoles edged with fuscous. Length 3 mm.

Vertex ½ longer at the middle than next the eye, apex obtuse, disc convex, pale yellowish, marked with a broad black transverse band before the eyes, behind which is a dot near the eye, a curved line nearer the middle and the impressed line dark brown and behind the polished apex are two approximate black points, Face black with a few short arcs, a broken median line on the front, the disc of the cheeks and loræ and the sides of the clypeus, pale tawny yellow. Pronotum with five abbreviated pale longitudinal vittæ, the lateral mere spots, and a few black points on the anterior submargin;

basal angles, median and transverse lines of the scutellum blackish. Elytra pale, the areoles bordered with fuscous and the transverse veinlets marked with white. Breast and abdomen deep black, the narrow edges of the abdominal segments and pleural pieces pale. Legs pale, anterior and intermediate femora twice banded with blackish, the posterior blackish without; tibiæ with a row of black points at the base of the spines. Last ventral segment of the male long, hind edge concave; valve small, transverse, rounded behind; plates long, triangular covering the pygofers, more than three times the length of the valve, margins straight, fringed with stout bristles. Ultimate ventral segment of the female ½ longer than the penultimate, narrowed posteriorly, the hind edge feebly excavated with a minute rounded median tooth, the obtuse lateral angles marked with a tawny spot; pygofers stout, equalling the oviduct, the narrow inner edge and the base of the stout spines pale.

California. Described from a single pair received from Mr. D. W. Coquillett labelled *Cicadula fuscinervosa*, Uhler, M. S. This little species agrees very closely both in color and ornamentation with *D. pulicarius*, Fallen. It seems to be subject to considerable variation in the extent of the black markings especially on the vertex but the form of the genitalia is distinctive.

6. DELTOCEPHALUS, CONCENTRICUS, n. sp.

Head much wider than the pronotum, very feebly angled before. Vertex rounded to the base of the front, but 1-6 longer on the middle than next the eye, disc quite strongly impressed. Sides of the clypeus recti'inear and nearly parallel. Cheeks wide, outer edge deeply excavated below the eye, Pronotum short. Valve of the male a little longer than the last ventral segment, triangular, the apex with a shallow excavation either side of an acute median tooth; plates broad-triangular, apex obtuse; pygofers long, armed with a heavy brush of stout spines at the apex. Length, 4 mm.

Color black, Head fulvous; anterior edge of the vertex with a pale transverse band bordered above and below by a heavy b'ack line; disc with a transverse black spot not attaining the margin of the eyes. Face black; frontal arcs, sides of the clypeus at base with the apex of the front and the lower half of the loræ, yellow. Cheeks pale with a black cloud below the eyes. Pleural pieces, abdominal segments and the valve at base slenderly edged with yellow. Legs pale yellow; base of the anterior femora and its inferior edge, three bands on the intermediate and the posterior below, all the tibiæ on their inner edge and tips of the tarsal joints, black; spines of the tibiæ pale, those of the pygofers black. Pronotum whitish, fulvous on its anterior border, its disc and a few marks before fuscous. Scutellum fuscous, the margins of the apical field and two spots on the basal either side of the middle, fulvous. Elytra whitish tinged with fulvous on the costa; nervures concolorous; all the areoles bordered with fuscous, the apical enfumed.

Mountains of N. W. Colorado. Described from a single male example received from Prof. C. P. Gillette.

7. ATHYSANUS GAMMAROIDES, n. sp.

Female: Deep black; slender hind edge of the vertex, a transverse band between the ocelli, bisinuated above, and the apex of the ovipositor fulvous. Rostrum knees and spines of the posterior tibiæ pale. Length 3½ mm.

Front convex in both diameters, its length and breadth equal; clypeus oblong, its sides parallel, base a little elevated, apex and sides depressed. Cheeks broad, strongly angled without where the surface is longitudinally striated. Vertex sloping and broadly rounded before, but little longer on the middle than next the eye. Pronotum broad and short, ½ longer than the vertex, its surface strongly transversely rugose, and punctured on the anterior margin. Scutellun small, shorter than the pronotum, apex slender, acute, sides concavely arquated, surface closely punctured, with two discal impressions. Elytra short, coriaceous, roughly punctured and shageened, together nearly square, their apex truncated, reaching onto the second abdominal segment, Abdomen tapering rapidly posteriorly and tipped with the long exerted oviduct. Last ventral segment short, feebly concave behind, the outer angles cut off obliquely.

Described from a single female example captured in Madison Co., Kansas, by my brother M. C. Van Duzee. Another female from Colorado was in a lot received from Prof. C. P. Gillette.

8. EUTETTIX SOUTHWICKI, n. sp.

Allied to *E. lurida*, but much smaller with the vertex more sloping and the pronotum more strongly concave behind. Length 4 mm.

Color deep fulvous-brown blotched with pale on the base of the vertex and the anterior margin of the pronotum. Cheeks lorœ and clypeus tinged with yellow and duller in color; sutures and a cloud below the eye blackish; clypeus more than usually expanded at apex. Pronotum with an obscure pale median line and tinged with greenish on the disc as is also the base of the elytra. Apical margin of the scutellum yellow. Elytra bright smoky-fulvous, a little more embrowned at apex; nervures slender and nearly concolorous, those of the clavus marked with brown at apex. Wings smoky, highly iridescent, imparting a coppery tint to the closed elytra. Pectoral pieces blackish on their disc. Venter pale with three longitudinal more or less distinct bands not attaining the sixth segment, the median broader and carrying a yellow spot at base. Plates with a longitudinal line and tip dusky. Disc of the tergum more or less invaded with black. Legs pale with a row of fine black points on the edges of the femora and some larger dots at the base of the tibial spines. Valve broad and short, rounded behind; plates large, as in *lurida*, acute at apex, outer edge moderately arquated at base and a little concave near the tip.

New York. Described from two male examples taken near New York City by Dr. E. B. Southwick who has added much to our knowledge of the New York hemipterous fauna and to whom this species is respectfully dedicated. By its deep rich

brown color this is quite distinct from any other species yet described. Were it not for its small size it might be presumed to be the male of *marmorata*.

9. EUTETTIX SLOSSONI, n. sp.

Form and size of *lurida* to which it is closely allied Face whitish tinged with fulvous on the clypeus and disc of the front; a dash below the lower angle of the eye, a point at the base of the antennæ and a broad transverse band on the base of the front, black, the latter bisected by a pale median longitudinal line. Eyes rufous. Vertex, pronotum and scutellum pale yellowish, an obscure interrupted band near the base of the pronotum and a few clouds on the basal field of the scutellum fulvous. Elytra whitish hyaline, nervures and broad basal and sutural margins fulvous, deepened in color next the commissural nervure and interrupted by the pale tips of the two claval nervures and a common large oval greenish-white commissural spot just anterior to the tip of the clavus; apical areoles embrowned. Wings hyaline, smoky at tip and somewhat iridescent. Below whitish, pectoral pieces and base of the venter with a large black spot. Tergum yellowish becoming fulvous posteriorly and banded with black on the third, fourth and fifth segments. Pygofers fulvous, nearly equalling the oviduct. Last ventral segment pale, posterior margin excavated either side of an obtuse median tooth almost exactly as in *lurida*. Length 5½ mm.

Described from one female specimen captured at Charlotte Harbor, Florida, by Mrs. Annie Trumbull Slosson to whom I take pleasure in dedicating this interesting form. It is a typical *Eutettix* agreeing with *lurida* in most of its characters. The elytra are marked somewhat as in *marmorata* but it is smaller. The broad black bisected band on the apex of the head will distinguish this from all our other described species of *Eutettix*.

10. SCAPHOIDEUS LUTEOLUS, n. sp.

Form and size of *auronitens*. Dull fulvous-brown, brighter on the vertex and scutellum; apex of the head and base of the vertex whitish in the males, tinged with fulvous in the females; anterior edge of the head with about three concentric black lines, one above connecting the ocelli, another on the extreme edge and the other below at the base of the front. Below pale tawny yellow, tinged with fulvous on the face and marked with a few pale arcs toward the base of the front, apex of the scutellum paler, in the female whitish and calloused. Membrane of the elytra paler with a broad fuscous cloud at apex, the postnodal cell subhyaline, nervures fuscous heavily margined beyond the middle. Wings smoky with strong fuscous nervures. Posterior feet banded with fuscous at the tip of the tibia and base of the second tarsal joint. Abdomen in the male blackish, the segments narrowly edged with pale, last ventral segment and genital pieces pale, the former dusky at apex, tip of the pygofers blackish. The female has the abdomen concolorous with the breast with the seg-

ments narrowly edged with white and with a large black spot at the apex of the last ventral segment. Length 4 mm.

Valve of the male large, obtuse. Plates large, oval, tapering to a slender point, much surpassed by the narrow pygofers. Last ventral segment of the female long at the middle, the outer angles retreating; pygofers slender, surpassed by the thick oviduct.

Described from one female taken at Anglesea, N. J., on July 16th by Prof. J. B. Smith, and three males captured near New York City, by Mr. E. B. Southwick, on July 6th, and August 12th, 1891. In this species the female is more brightly colored than the male with a pale transverse band on the pronotum, and the males when fresh have a large pruinose patch on the middle of the costal margin as in *Acinopterus acuminatus*, *Xestocephalus tessellatus* and a few other species of Jassidæ.

11. SCAPHOIDEUS LOBATUS, n. sp.

Form of *immistus* nearly but with a shorter and broader vertex and longer pronotum, elytra fulvous becoming deep brown on the clavus where there is a lobate ivory-white commissural mark. Length 6 mm.

Vertex a little over one half the length of the pronotum. Front proportionately broader than in *immistus*. Color greyish testaceous, whitish above, Vertex faintly washed with brown omitting a white basal area; anterior edge white bordered behind by a wavy brown line; anterior submargin with a deep brown concentric line. Front pale brown with a few obsolete whitish arcs; temples showing a brown dot and a brown cloud covers the antennal depression and invades the cheek outwardly. Pronotum irrorated with brown, with three nearly obsolete longitudinal pale vittæ. Scutellum whitish with four brown marginal points, the basal angles fulvous. Beneath whitish, faintly clouded and marked with brown on the incisures of the connexivum. Tergum brown, the lateral margins and narrow edges of the segments pale, Apical one half of the tarsal joints of the hind feet and a row of dots at the base of the tibial spines, dark brown. Elytra fulvous with the nervures and numerous irregular veinlets or pigment-lines, more regular in the costal areole, dark brown; disc of some of the areoles and a cloud within the apex dark brown; clavus mostly ivory-white with a large irregular fulvous-brown cloud resting on the suture and becoming deep blackish-brown toward the pale commissural nervure where it is bissinuate; this, when the elytra are closed, leaves a white, more or less distinctly trilobate commissural mark which expands over the base of the clavus. Wings smoky, iridescent, with fuscous nervures. Valve of the male small, brown, Plates narrow, their slender recurved tips brown and fringed with long white hairs. Last ventral segment of the female long on the middle, its apical margin feebly sinuated and rapidly retreating either side, median line feebly keeled, extreme tip brown; pygofers brown, a little exceeded by the oviduct and armed with numerous brown bristles.

New York. Described from a fine pair taken at Lancaster, N. Y. and a number of examples of both sexes taken by Mr. E.

B. Southwick near New York city. This pretty species is most nearly related to *S. intricatus* Uhler, from which however it is quite distinct. A pair of the latter, which apparently is a rare species, was captured at Agricultural College, Mich., by Mr. G. C. Davis in Aug. and Sept.

12. **THAMNOTETTIX PERPUNCTATA**, n. sp.

Allied to *T. Fitchi* but smaller and more slender, very similar in color and ornamentation to *Deltocephalus nigrifrons* Forbes. Length 3½ mm.

Vertex nearly flat, ¼ longer on the middle than next the eye, color pale yellow, greenish testaceous on the pronotum, vertex obsoletely clouded with fulvous near the eyes and behind the apex; four dots placed on the anterior edge superiorly, two on each temple and another on each ocellus; antennal pits, sutures of the face, a line on the middle of the clypeus expanded near the apex, and about six arcs on each side of the front, black. In typical examples the black frontal suture is continued around each compartment of the front connecting with more or less of the lateral arcs, or the front may be black with an interrupted median line and about five short arcs yellow. Cheeks with a brown discal cloud. Abdomen and breast black. Connexivum, margin of the tergum and sometimes the narrow edge of the propleura yellow; tips of the coxæ and the legs pale testaceous, the femora sometimes clouded with brown. Pronotum with about five pale vittæ sometimes nearly obsolete. Scutellum yellow, at times marked with a brown longitudinal vitta, impressed line black. Elytra pale, subhyaline, sometimes clouded toward the apex and on the tip of the clavus, nervures greenish white. Wings whitish hyaline, highly iridescent, nervures slender, brown. Ultimate ventral segment of the female a little concave behind, sometimes with a small median tooth; pygofers acute at apex, hardly exceeded by the stout oviduct. Valve of the male short and rounded, the plates triangular, constricted near their apex, edge but feebly arquated at base and fringed with long white bristles. In *D. nigrifrons* the plates are broader and more obtuse at apex, with the edges rectilinear or slightly convex and armed with shorter bristles.

This insect, though quite distinct generically from *Deltocephalus nigrifrons* is difficult to distinguish in its specific characters, the markings are almost identical and the form of the facial and genital pieces differ but little. *D. nigrifrons* is much the stouter insect and has a broader front and vertex, the latter more convex and obtuse before and marked with a transverse brown cloud before the middle in *nigrifrons*. *Th. Fitchi* is a larger insect with but four black spots on the anterior edge of the vertex.

New York, N. Carolina, Mississippi. Described from numerous individuals of both sexes received from Mr. Howard Ewart Weed, taken in Miss. The N. C. specimens were collected on

Mt. Balsam, near Asheville, in July, by Mr. J. W. Palmer, Jr. of Buffalo, N. Y. Mr. E. B. Southwick has sent me examples from the vicinity of New York city and I have taken it about Buffalo in August.

13. **THAMNOTETTIX AUREOLA,** n. sp.

Allied to *Th. flavocapitata* but larger with a more pointed vertex. Length 5 mm.

Vertex nearly ½ longer on the middle than next the eye. Clypeus a little expanded toward its broadly rounded apex. Color pale whitish yellow, deeper on the abdomen; vertex fulvous; eyes rufous, pronotum and scutellum deep fulvous-brown; elytra subhyaline, washed with clear greenish yellow at base and bearing on the sutural margin a large ill-defined smoky patch, which may be extended along the suture to the tip and become broken by the turgid yellow apex of the outer claval nervures, nervures of the corium slender, yellowish. Tergum blackish on the disc; beneath and the feet immaculate. Valve obtuse, triangular, the sides a little concave; plates rather large, subacute, fringed with long white bristles, Wings faintly smoky-hyaline, iridescent, with brown nervures.

California. Described from a single male example received from Mr. D. W. Coquillett labelled *Thamnotettix aureola*, Uhl. It is a beautiful little species quite characteristic of this genus which seems to be well represented on the Pacific Coast.

TINOBREGMUS, n. g.

Allied to *Jassus*. Head narrow, short conical, obtuse. Vertex narrow, widened anteriorly, and expanded posteriorly behind the eyes, tumid before. Ocelli on the vertex near its apex. Front rather strongly elongated; temples very narrow. Eyes large, Clypeus large; Cheeks long and expanded below; loræ small and narrow. Pronotum short, wider than the head, the anterior and posterior margins subparallel scutellum very small, scarcely apparant. Elytra abbreviated, reaching the middle of the abdomen, first sector forked before its middle, the inner branch with one transverse nervure connecting it with the second sector, apical areoles five, the outer much larger and formed by the forking of the outer branch of the first sector. Wings rudimentary. Rostrum short, scarcely surpassing the elongated clypeus. Posterior tibiæ armed with numerous stout spines.

This genus is remarkable for its very small scutellum and its elongated face. The head is narrower than the pronotum and the eyes are angled behind leaving a triangular area either side at the base of the vertex. The pronotum is very short and the base of the front is reflected onto the apex of the vertex leaving the ocelli distinctly superior. This character and the elongated face seem to connect this genus with the *Tettigonidæ* near genus *Eucanthus* but its true position is probably near *Jassus*.

14. TINOBREGMUS VITTATUS, n. sp.

Form of *Liburnia vittatifrons* Uhler nearly; tawny yellow marked with darker. Length 6½ mm.

Vertex twice as long as its least width, its disc slightly raised above the level of the eyes, shagreened and obliquely furrowed anteriorly, ocelli a little more distant from one another than from the eyes. Front feebly convex, closely punctured, its length three times the width at the extremities, sides moderately arcuated. Clypeus as broad as the apex of the front, slightly widened to the point of the cheek then narrowed to the broad apex which is excavated for two thirds of its width. Loræ narrower then the clypeus and about one-half its length. Cheeks about the breadth of the front, widest opposite the base of the clypeus, sides parallel above, surface distinctly wrinkled without. Pronotum shorter than the vertex, the sides rounded, ecarinate, disc obsoletely transversely wrinkled. Pygofers large considerably exceeded by the stout oviduct. Last ventral segment long, feebly keeled, the hind edge subangularly produced on the middle. Hind tarsi elongated, first joint longest, second short.

Color pale tawny yellow. An arcuated spot behind each ocellus and the basal sutures of the front piceous; front marked with a broad longitudinal vitta on each side in which may be indications of tranverse striæ; pronotum with six longitudinal vittæ, the middle pair fulvous, the others piceous. Elytra dusky-fulvous with heavy pale nervures and about four fuscous spots next the apex. Tergum mostly black at base, the four apical segments with an obscure transverse brown band across the middle of each and a common indistinct median line; genital segments piceous on the sides. Pectoral pieces mostly black which color may be extended over the coxæ and base of the venter.

Florida. Described from two female specimens received from Mr. C. W. Johnson of Philadelphia.

XESTOCEPHALUS, n. g.

Trans. Am. Ent. Soc. XIX, p. 298, Dec. 1889.

Form ovate, Head narrower than the pronotum tumid or subconical and rounded before, closely punctured, without rugæ, Vertex sloping, convex in both diameters, ocelli on the rounded anterior edge of the head, placed a little superiorly and distant from the eyes. Front very broad above, tapering rapidly to the broad and short clypeus. Cheeks wide; temples very narrow, antennæ crowded close against the eyes, basal joint rather long. Eyes subtriangular, a little excavated against the antennæ. Elytra almost coriaceous, more or less rugose or punctured, appendix wanting; inner branch of the outer sector united to the second sector by two transverse nervures; apical areoles five, the postnodal large, the second still larger; anti-apicals three, the outer small and narrow, the middle as large as both the others. Wings forming a narrow margin exterior to the costal nervure, the latter forked at the stigma, the outer branch evanescent, the inner united to the outer branch of the adjoining nervure by a transverse veinlet long before the apex; marginal vein extending only to the inner sector as in *Acocephalus;* the four apical nervures either attain the edge of the wing or they end blindly.

The three known species of this genus are shiny little creatures of a brown mottled aspect. The termination of the marginal nervure of the wing before the apex and the position of the ocelli will at once show their relationship with *Acocephalus*, from which genus their tumid punctured head will seperate them. The ocelli are placed more inferiorly than is usual in the *Acocephalina* on account of the encroachment of the vertex onto the base of the front.

15. XESTOCEPHALUS PULICARIUS, n. sp.

Brown varied with pale yellowish, Vertex twice as long on the middle as next the eye, marked with a double pale median line which is deflected to either side just before the tip and runs parallel with the anterior edge to the outer angle of the eye. Sometimes this line forms a loop behind the ocellus where it may break and form a dot on the disc: Usually there is a dot at the basal angle of the eye, a line between the ocellus and eye and two concentric wavy lines on the base of the front; apex of the head fulvous. Pronotum marked with four dots on the anterior submargin, the outer angles, a dot adjoining and a few obscure marks on the disc. Basal field of the scutellum with two median pale vittæ, diverging posteriorly, apical field pale, dusky on the disc. Elytra brown marked with one or two whitish spots in each areol except the costal which is subhyaline nearly to its base. These spots frequently become confluent along the inner margin of the corium and at its apex. Face tawny yellow, more or less washed with brown especially on the front and loræ. Beneath and legs tawny, posterior tibiæ and base of the venter generally embrowned. Last ventral segment of the female emarginate at the middle leaving a feebly rounded lobe on either side; pygofers triangular, broad at base, the acute tip moderately exceeded by the stout oviduct, Ultimate ventral segment of the male nearly double the length of the penultimate, its posterior edge broadly excavated, Valve scarcely appearant, slightly arcuated behind; plates ligulate at base, tapering beyond the middle to the obtuse apex which is fringed with long, soft white hairs and armed along the inner edge with a few stout spines. Length 2½ to 3 mm.

New York, Canada. This pretty little insect is sometimes abundant in August and Sept. about Buffalo in swampy pastures where *Carex vulpinoidea* grows. I have also taken it at Ridgeway Ont., and Mr. E. B. Southwick has sent me two examples captured near New York City in August. The markings of the vertex and pronotum are at times partially obliterated but the geminate median line on the vertex and the divergent vittæ on the base of the scutellum seem to be constant.

16. XESTOCEPHALUS FULVOCAPITATUS, n. sp.

A little larger than the preceding with the head clay-yellow or tinged with fulvous, generally immaculate except a brown spot on the loræ and a black cloud beneath the antennæ, sometimes the females exhibit an oblique brown dash on either side on the disc of the vertex. Pronotum and scutel-

lum pale brown or tawny yellow. In fully colored examples the former has a blotch behind the eyes and the basal angles of the latter are brown, frequently these marks are absent and the apex of the scutellum may be fulvous like the vertex. In this form the elytra are more distinctly marked than in *pulicarius*. On the corium are two semipellucid spots at base and about six at apex, more or less coalescent; an oval spot on the base of the antiapical areoles and two more, sometimes forming a band before the middle, are whitish. Wings milky with the nervures at apex brown as in the preceding species. Abdomen brown with the convexivum, edge of the tergum, apical half of the last ventral segment and narrow margin of the others, pale. Genital characters as in *pulicarius*. Length 3½ mm.

New York. Of this species I have taken one male and four female examples at Lancaster, N. Y., in August and September in company with the preceding of which it may prove but a variety.

17. XESTOCEPHALUS TESSELLATUS, n. sp.

Pale testaceous. Vertex with dark-brown irrorations which become aggregated either side of the middle; ocelli placed on large pale dots; face brown irrorated with pale in the female, or pale and nearly immaculate in the male. Pronotum testaceous-brown, darker on the disc, irregularly irrorated with pale and marked with a blackish spot behind the inner angle of the eye. Scutellum pale brown, obsolete'y dotted with paler, the basal angles and sometimes a line between them partly covered by the pronotum, blackish; the apex pale. Elytra testaceous, the nervures alternated with dark brown and white; a mark on the base of the clavus, two quadrate spots on the costa including two dots between them, blackish; apex of the elytra paler marked with four large squarish, brown marginal spots. Wings white with pale brown nervures. Disc of the tergum, base of the venter and some clouds on the pleural pieces brown. Apical margin of the last ventral segment of the female feebly concave and minutely notched at the middle; pygofers proportionately a little shorter than in *pulicarius* and the plates of the male are more strongly narrowed from near the base to a slender point. Valve concealed. Length 4 mm.

Charlotte Harbor, Florida, Mrs. Annie Trumbull Slosson; Mississippi, Howard Ewarts Weed; Texas, "Aaron." Described from one male and four female specimens. This species is larger than the foregoing and may be distinguished by its irrorated vertex and pronotum, the blackish basal angles of the scutellum, the testaceous elytra marked with large marginal brown spots, and the varigated elytral nervures. Most of the specimens show a large oval white pruinose spot on the middle of the costal margin of the elytra, but this may be characteristic only of the breeding season.

The Pendulum and its Laws of Oscillation.

Read before the Buffalo Society of Natural Sciences, Feb. 12th,

By Austin M. Edwards.

HISTORICAL.

History furnishes us with the information that Galileo, in 1542, while in the Cathedral at Pisa, observed the oscillations of a lamp which had been accidentally set in motion. He was struck with the apparent measured regularity of its vibrations and tested this observation by comparing these oscillations with his own pulse. Galileo there invented the simple pendulum as a means of measuring short intervals of time. But for many years the pendulum was used without the clock movement, and astronomers counted the oscillations performed in a given time to measure the periods of celestial phenomena.

THEORY.

In describing the pendulum, I will first begin with a theoretically perfect pendulum, which would consist of a heavy molecule suspended at the extremity of a perfectly flexible cord, and oscillating in a vacuum. This ideal pendulum, of course, could not exist, but to demonstrate the simple pendulum, we will use a small metal ball suspended by a silk thread; if this freely suspended ball is drawn from the vertical and allowed to oscillate, these oscillations will gradually diminish in extent, on account of the earth's attraction, producing what are called long and short arcs. The function of the clock movement proper, besides registering the time and number of oscillations on the dial, is to furnish to the pendulum the small amount of impulse that is necessary to carry the same in its excursion from the vertical line upwards, so it will return each time to the original point of starting, and thus overcome the influence of gravity, and add enough force in its descent towards the vertical to maintain a uniform arc of oscillation to the required number of degrees. The oscillations of the pendulum were thought and

affirmed by Galileo to be made in the same interval of time, whether the arcs were long or short.

That there is a difference, although very slight, between long and short arcs, where the distance passed over is not too great, is nevertheless true; and it was not until 1658 that Huyghens discovered and proved that long arcs required more time than short arcs to perform the oscillations of the same vibrating length of pendulum. I will add here, as the question is often asked, what constitutes the *length* of a pendulum. It is the distance from the point of suspension to the center of oscillation. This point is in theory very near the center of gravity of the pendulum; and it described as being just below the gravity point. In order to describe the center of oscillation more clearly, I will make this simple illustration.

If a blow is struck with a club and the impingment takes place beyond the point of concussion, the blow is partially inflicted on the hand; and the same result is experienced if the impingment takes place between the hand and the point of concussion, only in a reversed manner. The full force of the blow is obtained only when the exact point of concussion meets the object. Now, it is true that the center of oscillation in the pendulum is identical with the point of concussion in the club, and the time producing qualities of a pendulum depend entirely on the above mentioned oscillating point.

LAWS.

I will first call your attention to the laws of motions controlling the simple pendulum, and will refer to the cycloidal pendulum later. First, the pendulum is a falling body, and is controlled by laws governing such a body, and when at rest points directly toward the center of the earth. Next, the square of the time of oscillation is directly at its length, and inversely as the earth's attraction.

For instance, a pendulum vibrating seconds at the level of the sea, in the latitude of New York city, would be 39.02 inches, and a pendulum vibrating two seconds in the same location would be the square (of the time) or two seconds, which squared would be four, multiplied by the length of the one second 39.02 pendulum, which is equal to 156.08 inches, something over 13 feet long. This rapid increase in length for a comparatively

small change in the time of oscillation has resulted in fixing two seconds as the limit for any precision pendulum, as beyond this point the instrumental errors would be increased in the same ratio and would be difficult to overcome. The great Westminster pendulum vibrates in two seconds, and is probably the most accurately compensated long pendulum in the world. The correction for errors of lateral and cubical dilatation, barometrical error, long and short arcs of oscillation are all reduced to a minimum.

As we have said so much about seconds, it might be in order to say there are two kinds, solar and sidereal, and they differ from each other in length.

The interval of time we call a second is reduced from the solar day, which is the time between two successive returns of the sun to the same meridian, and this interval divided into 86,400 parts. These solar days are not *equal*, but are made so by the daily equation of time added to or subtracted from the *apparent* solar day.

The sidereal day is the interval between two successive returns of a fixed star to the same meridian and is 3 minutes, 56.5 seconds shorter than the solar day, and this day divided into hours, minutes and seconds furnishes us with the sidereal seconds. The sidereal day represents the time of the rotation of the earth on its axis, and is the most accurate observation of time that can be made, as it requires no equation, and has not changed as much as one-hundredth part of a second in over two thousand years. Astronomers use astronomical clocks reading 24 hours on the dial, with pendulums vibrating sidereal seconds, and by this time only do they find and locate celestial bodies.

MUTUAL ATTRACTION.

Another law governing the pendulum is this: The action of gravity or the mutual attraction between bodies varies with their masses, and inversely as the square of their distances. Following from this, a pendulum will vibrate seconds only in a given place. Our standard of measurement is taken from a pendulum vibrating seconds in a vacuum at the level of the sea. It also follows that the further a pendulum is removed from the center of the earth the less it will be attached in its descent toward the vertical. This explains why a pendulum loses on

being transferred from the sea level to the mountain, or from one of the earth's poles toward the equator, as the earth is a spheroid slightly flattened at the poles.

A very interesting experiment can be made to show the influence of mutual attraction between masses. Take two well-regulated astronomical clocks with seconds pendulums, place them side by side, and cause each pendulum to oscillate simultaneously on the same side of the vertical, the pendulums will oscillate to the right together, and to the left for a time together, then they will change so as to oscillate in opposite directions and will never depart from this motion. Another reason why a pendulum loses on being transferred to the equator, lies in the fact that the rotation of the earth gives rise to centrifugal force at its surface. This, being zero at the poles, gradually increases to a maximum at the equator; and, as it acts in opposition to the force of gravity, it counteracts a gradually increasing proportion of this force which shows in the time of oscillation. The rotation of the earth on its axis also has another effect upon the oscillation of the pendulum as you have just seen by the demonstration of the pendulum of Foucault by Prof. Kellicott. The error caused by the tendency of the pendulum to oscillate in one given plane is reduced to a minimum by the use of short arcs of oscillation, and is of very little importance in comparison with other errors.

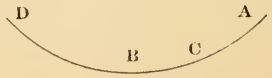
CYCLOIDAL PENDULUM.

The arcs of oscillation of any ordinary simple pendulum are a part of a circle with the point of suspension as a center.

Now, a pendulum producing isochronal oscillations; namely, producing *unequal arcs* in *equal* time is called *cycloidal* because the center of oscillation must describe a cycloidal path during each excursion on either side of the vertical line.

This curve is one of the most interesting of any known, both in respect to its geometrical properties and connection with falling bodies, and is described in this manner:

If a circle roll along a straight line on its own plane, a point on its circumference will describe a *curve* which is called a cycloid. The peculiar value of this curve in relation to the pendulum will be better shown by inverting a cycloid curve as we have here illustrated.



The time of a body descending from a point of rest A to the lowest point of the curve at B will be the same from whatever point it start. In other words a pendulum will fall from A to B in precisely the same time it would from C to B, which is about half the distance. Following from this, a cycloidal pendulum produces *unequal* arcs in *equal* time, or isochronism. The extreme mechanical difficulty of executing a pendulum that will describe a cycloidal path during each excursion has lead horologists to originate many ingenious devices to accomplish this end. This pendulum which I show you to-night is constructed so as to cause the center of oscillation to move in a cycloidal path by coming in contact with cycloid cheeks near its point of suspension, but the effects of moisture, friction, dilatation and adhesion of contact against these cheeks would in time give rise to errors as great as those sought to be overcome.

We therefore must make efforts in another direction.

The best method of to-day for producing isochronism is to cause the arc of oscillation to be as short as possible, and also have the suspension spring of a given length and given strength in proportion to the length and weight of the pendulum. Then we will only have to deal with the molcular arrangement of the spring which is constantly changing, but this error is very small and exceedingly regular.

(See Note "A", page 224.)

THE BAROMETRICAL ERROR.

A pendulum is effected by the density of the atmosphere, but to a degree that would only be of importance in a precision time piece; where all the errors are reduced to a minimum. An increase of density of the air is *equivalent* to reducing the action of *gravity*, while the inertia of the moving body remains the same. The rule is, that the velocity of the pendulum varies directly as the force of gravity, and inversely as the inertia and it follows then that an increase of density diminishes the velocity and shortens the time of oscillation, causing the clock to gain time. The barometrical error can be reduced to within three to four-tenths of a second in twenty-four hours for each inch rise or fall of the barometer. Short arcs of oscillation are also essential in reducing the barometrical error. An apparatus is sometimes attached to the pendulum to assist in reducing this error.

THE COMPENSATED PENDULUM.

Bodies increase in volume with an elevation of temperature and diminish when it falls. The pendulum then changes its dimensions with every variation of temperature, and the same is the case with all other parts of the machine.

The elongation of a body in any *one* direction by heat, is known as its *linear dilatation*, and its increase in *volume;* that is, in all three directions, is the cubical dilatation; this depends on its linear dilatation in length, breadth and thickness.

The result to be obtained in a pendulum by compensation is to so construct the same that the center of oscillation will always be in the same point. It is evident that heat lowers this point and cold raises it, and as we said before, that the time-producing qualities of the pendulum depend on this oscillating point and only by *compensation* is the desired effect obtained.

I will show you two of the best methods of producing compensation, and begin first by using two metals. The principle underlying this method is the unequal expansion of different metals in the same temperature. This furnishes us with the first step towards compensation.

Let us take a steel rod of the length arrived at by calculation, with a nut and screw on the lower end, resting on this nut is a brass collar with a groove cut in the top. Here is a rolled and drawn zinc tube of a calculated length and thickness in proportion to the main rod. This zinc tube is drawn on over the main rod and rests on the brass collar at the lower end and at the upper end of the zinc tube, and resting on the same is an iron collar, into which is firmly screwed an iron tube which is slipped on over the zinc tube, and at the lower end of this iron tube is attached the weight or bob. It will be seen that this main rod lengthens with heat, and as it lowers, the zinc tube which surrounds it lowers also but the upper end of the zinc being free and this metal possessing greater linear dilatation, moves upwards on the main rod and with it draws up the iron tube that surrounds the zinc and carries with it the weight or bob. The upward dilatation of the zinc tube is just sufficient to overcome the downward dilatation of the main rod, thus keeping the center of oscillation in the same point. In order to construct a compensated pendulum of this kind it is necessary

to have the proper proportions of one metal to the other, and besides this corrections are made from actual tests in different degrees of temperature.

The principal objection to this kind of compensation is that metals expand and contract by infinitesimal waves or jumps, probably owing to the molecular friction of the metals, and this is most apparent in zinc, owing to its crystalline formation and this metal is useless unless carefully drawn and prepared before using for the purpose in question.

THE MERCURIAL COMPENSATION.

This pendulum is constructed in the following manner. A steel rod of the calculated length and diameter is selected, and at its lower end is firmly attached a brass stirrup into which is placed and secured, from one to four glass jars containing mercury. If one jar is used, the volume must be sufficient to allow its *cubical dilatation* to raise the center of oscillation just as much as the *longitudinal dilatation* of the rod has *lowered this point*, and if four jars are used, their diameters shall be reduced to the point, that the four will contain the volume of the one jar, and be filled each to the same level as it rose in the single jar. This represents more exposed surface to the changing temperatures, and improves the *conductibility* of the *mercury*, causing the compensation to *respond* more *promptly* to *sudden* changes. The four jar compensation is the most difficult to construct, but when well made and carefully adjusted is exceedingly satisfactory, and has the preference in seconds pendulums when greater accuracy is required.

THE SEISMIC ERROR.

This uncontrollable error is caused by earth waves, and may occur at any time. One peculiarity is, that many hours elapse before this error shows in the time of the instrument. This error may not be suspected until compared by transit observations.

The time it takes to develop this error is probably due to the molecular disturbances and re-arranging of particles that is taking place in the mercury used for compensation. The most accurately compensated pendulums have been known to vary several seconds in a day. I remember while in Geneva in 1872 that twice in one summer the standard pendulum of the Cantonal

Observatory varied, once seven and one-half seconds, and at another time, five seconds in twenty-four hours; at that time it was not well understood what caused these sudden variations in a pendulum having a known daily equation. But later experiments have shown this error to be caused by seismic waves.

From the simple observation of the lamp swinging from the roof of the Cathedral at Pisa, more than three hundred and forty years ago has grown the thought included in the foregoing laws. The laws of inverse squares and mutual attraction as shown in the simple pendulum, the properties of the cycloid and cycloidal pendulum, the influence of the linear and cubical dilatation, the influence of atmospheric pressure on the pendulum, and the centrifugal force from the revolution of the earth on its axis, and by reducing all these errors to a minimum we are furnished with an instrument that performs its work with as much accuracy as any piece of mechanism ever produced by man.

NOTE A.

The length of the pendulum rod is just double the diameter of the generating circle. Now, from relations of parts of the cycloid, it is shown that the time of falling down the semi-cycloid, is to the time of fall through the diameter of the generating circle, as a quadrant is to a radius.

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A Preliminary Review

OF THE

North American Delphacidæ.

By E. P. Van Duzee.

Subfamily Delphacida embraces a large assemblage of small active insects, mostly inhabitants of grassy meadows and pastures, where at times they inflict considerable injury by puncturing the leaves and tender fruit of plants valuable to man. Although individually much smaller than the members of our other sub-families of the Fulgoridæ they abundantly compensate in numbers for what they lack in size. In most characters they approach very closely to the Cixiida but they can at once be distinguished from these as from all allied groups found in North America by the presence of a large movable spur at the apex ot the posterior tibiæ, placed exteriorly to the base of the tarsi. They are strong leapers as their long powerful hind legs armed with numerous stout spines would indicate.

Most of our Delphacids, especially in genus *Liburnia*, occur in two more or less distinct forms: A macropterous or long-winged, and a brachypterous, or short-winged form. These terms are somewhat arbitrary as the developement of the elytra and wings may present almost any gradation from a mere

rudiment to a length equalling two or three times that of the abdomen. Frequently the long and short winged forms differ considerably in color and proportions, and the sexes are often very dissimilar.

Some of the most available characters for distinguishing the genera are the following: — The form of the antennæ, whether flattened or terete, and the proportionate length of the joints; the form of the front and vertex; the number of carinæ on the front, pronotum and scutellum; the point of forking of the median carina of the front, and the direction taken by those on the sides of the pronotum. In the large genus *Liburnia* excellent specific characters are found in the form of the genital segment of the male. When viewed from behind we distinguish the form of the aperature of the pygofers—The two pieces which, united above and below, form the wall of the genital segment. Dorsally these are notched to receive the anal tube and on the ventral aspect there is generally a sinus to receive the base of the stiles. These stiles are very variable in form in the different species but usually they are rather slender, curved outward more or less and convergent above toward the anal tube. The inferior wall of this anal tube is frequently produced in a more or less prominent incurved tooth on each side of the median suture. In the females the form of the pygofers varies somewhat as well as the proportions of the oviduct.

Thirty-two species and three genera are described as new in the present paper, making the number of species now recorded from North America, excluding known synonyms, fifty three, representing thirteen genera. Of these fifty three species eleven have not been positively identified by the writer and four were previously described from Europe.

No attempt has been made in the preparation of this paper to obtain all the material in this country that is available for study. Had this been done the number of species certainly would have been largely increased. But even in this fragmentary form it is hoped that these studies will be of some service as placing on a more systematic basis some of our more common forms. A large field for original work is open here to some student who has the time and perseverance to work out the affinities of these minute insects.

The following systematic list is appended better to exhibit the relationship between the species recorded in the ensuing pages:

Copicerus, Schwarz,
    irroratus Schwarz,
Stenocranus, Fieb.
    dorsalis (Fitch,)
    lautus Van D.
    palaetus Van D.
    saccharivorus (Westw.)
Kelisia, Fieb.
    axialis Van D.
    crocea Van D.
Megamelus Fieb.
    notulus (Germ.)
    marginatus Van D.
    piceus Van D.
    Davisi Van D.
Pissonotus Van D.
    marginatus Van D.
    ater Van D.
    delicatus Van D.
    basalis Van D.
    pallipes Van D.
    aphidioides Van D.
    dorsalis Van D.
    brunneus Van D.
Dicranotropis Fieb.
    maidis (Ashm.)
Phyllodinus Van D.
    nervatus Van D.
Laccocara Van D.
    vittipennis Van D.
    zonata Van D.
    ? obesa Van D.
Stobera Stal,
    tricarinata (Say,)
    concinna Stal,
    bifasciata (Prov.)
Liburnia Stal,
    ornata (Stal,)
    pellucida (Fall.)
    arvensis (Fitch,)
    furcata (Prov.)
    consimilis Van D.
    puella Van D.
    Osborni Van D.
    laminalis Van D.
    lutulenta Van D.
    Weedi Van D.
    obscurella (Boh.)
    lateralis Van D.
    Kilmani Van D.
    campestris Van D.
    lineatipes Van D.
    occlusa Van D.
    foveata Van D.
    incerta Van D.
    Gillettii Van D.
Achorotile Fieb.
    albosignata (Dahlbg.)
Pentagramma Van D.
    vittatifrons (Uhler)
Stiroma Fieb.
    inconspicua Uhler,

Uncertain Species.

Delphax vittata Stal,
" producta Walk.
" luteivitta Walk.
" unicolor Walk.
" pictifrons Stal.

Analytical Key to the Genera.

Basal joint of the antennæ much longer than the second, laminate expanded. *Asiraca* and *Delphax* (sens strict) (Note: These genera have not yet been recognized from North America.)

Basal joint of the antennæ little longer than the second joint or shorter. (2)

2. Antennæ, first joint and outer edge of the second, in part, broadly expanded. *Copicerus.*

   Antennæ not broadly expanded, sometimes more or less flattened. (3)

3. Lateral carinæ of the pronotum reaching the hind edge or sometimes becoming obsolete a little within the margin. (4)

   Lateral carinæ of the pronotum deflected outwardly behind the eyes, not touching the hind edge. (9)

4. Median carina of the front forked at the apex of the head, the lateral carinæ of the pronotum attaining the posterior edge. (6)

   Median carina of the front forked some distance below its base, or if forked on the apex of the head the lateral carinæ of the pronotum become obsolete before reaching the hind edge. (5)

5. Median carina of the front forked near or somewhat above its middle, the two branches abruptly seperated, then running parallel to near the apex of the head. *Dicranotropis.*

   Median carina of the front forked nearer the apex of the head, the two branches but slightly seperated, sometimes scarcely distinguished. Face in our species crossed by a transverse piceous band covering most of the clypeus. Apex of the front usually pale. Scutellum in typical species small and the elytra in brachypterous examples polished with the nervures nearly obsolete. *Pissonotus* n. gen.

6. Front narrow, nearly linear, gradually a very little widened below. Vertex narrow, truncated at apex, produced about one third of its length before the eyes.
Stenocranus.

Front broader, sides not parallel, (7)

7. Front widest a little above the middle. Apex of the vertex rounded, produced a little before the eyes, the carinæ becoming obsolete on the apex of the head.
Kelisia.

Front broadest below, generally much narrowed above between the eyes. Vertex square at tip, the frontal carinæ continued strongly distinguished over the apex of the head. (8)

8. Vertex but little advanced before the eyes. Basal joint of the antennæ in length subaequal to the second, flattened, obtriangular and oblique at apex; second joint flattish or nearly terete, papillate. Front narrow, sides nearly rectilinear, carinæ very prominent. Cheeks broad-triangular. Elytral nervures setigerous punctate. *Stobera.*

Vertex long, extended well before the eyes Basal joint of the antennæ shorter and more slender than the second, terete. Front distinctly widened below
Megamelus.

9. Front with one median carina. (10)

Front with two median carinæ. (12)

10. Anterior and intermediate tibiæ foliaceous. Insect short and stout. *Phyllodinus* n. gen.

Anterior and intermediate tibiæ slightly if at all expanded. (11)

11. Front very broad, six sided, with a distinct median carina forked at the apex of the head, either side with one or two rows of pitted granules. Vertex broader than long. Pronotum short, emarginate behind, truncated before, lateral carinæ following the contour of the eyes, papillate. *Laccocara* n. gen.

Front considerably longer than broad, sometimes almost linear, median carina forked at or near the apex of the head. Vertex nearly square. Pronotum proportionately longer and less deeply emarginate behind.

Liburnia.

12. Frontal carinæ not widely seperated, forming a linear compartment. Scutellum tricarinate. Front, sides of the pronotum and abdominal segments pustulate.

Achorotile.

Frontal carinæ widely divergent, forming an ovate compartment, broadest above and convex on the middle. Scutellum 5-carinate. Vertex five sided, rounded-conical before. Basal joint of the antennæ about one fourth the length of the second.

Pentagramma n. gen.

GENUS COPICERUS, Schwarz.

Kong. Vet. Akad. Nya Handl. XXIII, p. 180, 1802.
Stal. Ann. Soc. Ent. Fr., Series 3, V, p. 337, 1858.
Hemip. Africana, IV, p. 175, 1866.

Jeralia, Walk. List of Homop., Supl., p. 85, 1858.

Holatus, Guer., Hist. de L'Isle de Cuba, Ins., p. 429, 1857.

COPICERUS IRRORATUS, Schwarz.

Kongl. Vet. Akad., Nya Handl., XXIII, p. 181, pl. 6, fig, 2a, 1802.

Jeralia singula, Walk., List of Homop , Supl p. 85, 1858.

I have recently received an example of this southern form from Mr. Howard Ewarts Weed labeled "Agricultural College, Miss., Oct. 22nd 1894." Its conspicuous foliaceous antennæ readily distinguish it and its allies from our other North American Delphacidæ. The elytra of this specimen are whitish hyaline marked with setigerous brown dots. The commissural nervure is white, broadly interrupted with piceous on the middle, and on the corium is a very oblique piceous band from near the apex of the clavus to the outer angle, exterior to which is a brown cloud intersected by the white nervures. Wings subhyaline, clouded at apex, with strong brown nervures. The disc of the thorax is dull testaceous with the sides brown and the abdomen is deep testaceous or ferruginous broadly marked with black. The long black antennæ are expanded on the superior edge only.

GENUS STENOCRANUS, Fieb.

Fieb. Verh. der Zool-Bot. Ges. Wien, XVI, p. 519, 1866.
" Cicad. d'Europe, I, p. 83, 1875; II, pl. 7, 1876.
Mayr, Tabellen, I, p. 19, 1884.
Ashmead, Ent. Am., V, p. 27, 1889.

STENOCRANUS DORSALIS, (Fitch.)

Delphax dorsalis, Fitch Homop. N. Y. State Cab., p. 46, 1851. Reprint in Lintner's 9th. Rept., p. 386, 1893.
Walker, List of Homop., IV, p. 1136, 1852, (mention.)

Liburnia dorsalis, Van Duzee, Psyche V, p. 28, 1888.

Stenocranus dorsalis, Van Duzee, Psyche V, p. 390, 1890.
Osborn, Proc. Iowa Acad. Sci. I, pt. 2, p. 127, 1891.
Harrington, Ottawa Nat , VI, p 31, 1892.
Van Duzee in Lintner's 9th. Rept. p. 410, 1893.
" Bul. Buf. Soc. Nat. Sci., V, p. 191, 1894.
Gillette & Baker, Hemip. of Colo., p. 69, 1895.

Delphax unipunctata, Prov., Nat. Can., IV, p. 319, 1872.
Prov., Pet. Faune Ent. du Can., III, p. 224, 1889.

This species seems to be common throughout the Northern and Eastern States and Canada and extends its range westward into Iowa and Colorado. Here it inhabits damp swampy spots overgrown with carices where it may be found in greatest abundance during August and September, and more rarely in May when the grass is fresh and green.

STENOCRANUS LAUTUS, n. sp.

Form and size of **dorsalis** nearly. Brownish fuscous marked with a conspicuous pale yellow vitta from the apex of the head to the tip of the clavus. Front and clypeus deep black with the carinæ pale. Elytra fulvous brown with the costal and about the two outer apical areoles subhyaline; nervures brown. Inner areoles of the membrane deeper brown or fuscous, and a fuscous cloud may follow the first and second apical nervures. Abdomen black; the lateral margins, narrow edges of the ventral segments, and a medium vitta, pale. Legs slenderly lineated with brown. The deflexed edge of the pronotum with a brown line. Length 5 mm.

In most of its characters this species does not differ from **dorsalis.** It is, however, a little smaller, darker in color, the elytra are darker, especially on the inner half of the membrane, and the outer nervures of the membrane are conspicuously dark. The small apical areole formed by the forking of the second apical nervure is broader and shorter than in **dorsalis,** and the abdomen is darker in color.

S. dorsalis is of an almost uniform fulvous yellow color with a paler dorsal line, and the elytra are nearly transparent and marked with one straight longitudinal brown line at apex covering the fourth apical nervure. The wings in both species have a few brown nervures toward their apex.

From **palaetus** the present species may be distinguished by the smaller spur, the shorter basal joint of the antennæ, and the markings of the elytra which are quite different.

New York, Virginia. Described from two male examples; One received from Dr. E. B. Southwick, taken near New York City; the other from the National Museum labeled "Virginia, Oct. 9th, 1881". The latter bears the name which I have adopted for this species. It was applied by Dr. P. R. Uhler but the description was never published.

STENOCRANUS PALAETUS, n. sp.

Form and size of **dorsalis**. Color fulvous yellow above, paler beneath; median line on the base of the vertex, disk of the pronotum between the lateral carinæ and apex of the scutellum, whitish. Frontal foveæ interruptedly black over the apex of the head from the base of the antennæ to the middle of the vertex; face crossed by a brown band below the antennæ, and another crosses the base of the clypeus and extends over the anterior coxæ and pleural pieces. Apex of the front and its median carina interruptedly pale. First joint of the antennæ a little shorter than the second, blackish, the base of the second with a piceous spot. Eyes black. Legs pale, the femora lineated and the tibiæ twice banded with brown.

Elytra subhyaline, nervures yellowish, the commissural white with a brown line before the apex of the clavus. Inner sector of the corium and the apical nervures, except the base of the two outer, fuscous; and a smoky cloud covers the anastomosis at the base of the middle apical areole and spreads feebly over the inner area of the membrane. Tergum brownish. Spur unusually large, foliaceous.

In this species the vertex is a little more strongly produced than in our northern **dorsalis**, the hind edge of the pronotum is not so deeply excavated, and the front is more widened apically.

Florida. Described from one female received from Mr. C. W. Johnson of Philadelphia.

? STENOCRANUS SACCHARIVORUS, (Westw.)

Delphax saccharivora, Westw. Mag. of Nat. Hist., VI, p. 413, 1833.
Hab. Granada, W. I. (Westw.)

From Prof. Westwood's description and drawings it seems quite likely that this insect is a **Stenocranus**. His correspondent reported it very destructive to sugar cane in the island of Granada.

GENUS KELISIA, Fieb.

Fieb., Ver. der Zool. Bot. Ges. Wien, XVI, p. 519, 1866.
" Cicad. d'Europe, I, p. 83, 1875; II, pl. 7, 1876.
Sahlbg., Cicadariæ, p. 416, 1871, (Subgenus of **Stenocranus**.)
Mayr, Tabellen, I, p. 18, 1884.
Ashmead, Ent. Am. V, p. 27, 1889.

KELISIA AXIALIS, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci. V, p. 191, 1894.

Form of **K. guttula**; Above piceous brown, beneath pale dull testaceous. A wide yellow vitta extends from near the apex of the vertex to the second dorsal segment of the abdomen. Elytra hyaline with an axial brown vitta. Length 4 m. m.

Vertex tinged with testaceous on the anterior margin; entire face testaceous, obscurely marked with darker on the front next the lateral carinæ; antennæ yellow, paler toward their tips; eyes rufous; pronotum dark brown from the dorsal vitta to below the lateral margins; meta-, and mesonotum

piceous brown with a broad median vitta extending onto the two basal segments of the tergum; lower surface and legs pale dull testateous; mesonotum with a large brown spot; tarsal spines tipped with black; abdomen blackish brown, the sides of the venter varied with testaceous. Elytra hyaline, with a conspicuous brown vitta from the base to the extreme apex following the line of the second sector; first sector and the two first apical nervures white, the others brown or mostly so; apical nervures four, the interior forked.

This species may be distinguished from its european congenors by its glassy elytra marked with a conspicuous longitudinal vitta, by the uniformly testaceous inferior surface, and the absence of the black spots on the cheeks. Described from two examples representing both sexes, taken at Lancaster, N. Y. in August 1886.

KELISIA CROCEA, n. sp.

Stenocranus sp. Osborn, Proc. Iowa Acad. Sci , I, pt. 2, p. 127, 1891.

General appearance of **Stenocranus dorsalis** but smaller with a wider front. Length 4½ m. m.

Female: Pale yellowish; a dorsal whitish vitta on the vertex pronotum and scutellum, and a similar one on the face, broadest on the apex of the front. Legs, pleural pieces and the margins of the abdomen paler. Elytra whitish hyaline, with distinct white setigerous nervures. Eyes brown.

Male: Color fulvous, at least in fully matured examples, with a paler dorsal vitta covering the middle of the vertex, pronotum and scutellum, in which is a white longitudinal line. Median carina on the front and a longitudinal vitta in each fova, whitish; pronotum paler; tergum usually black with the margins and an irregular spot on the disc fulvous; venter covered more or less by a blackish cloud; apex of the elytra with a fuscous cloud which is intensified toward the inner angle, and extended somewhat along the sutural margin. Eyes, claws and tip of the rostrum black.

Iowa. Described from 5 ♂ and 3 ♀ examples received from Prof. Herbert Osborn labeled "Ames, Iowa." In this species the front is broader than in **Stenocranus dorsalis;** the elytra want the distinct brown line along the second inner apical nervure ; the lateral compartments of the front are whitish instead of black and the insect is somewhat smaller.

GENUS MEGAMELUS, Fieb.

Fieber, Verh. der Zool. Bot. Ges. Wien, XVI, p. 519, 1866.
" Cicad. d'Europe, I, p. 82, 1875; II, pl. 7, 1876.
Sahlberg, Cicadariæ, p. 411, 1871.
Mayr Tabellen, I, p. 18, 1884.
Ashmead, Ent. Am., V. p. 26, 1889.

MEGAMELUS NOTULUS, (Germ.)

Delphax notula, Germar, Thom Archives II, p. 57, 1830.
Stal, Of. Vet. Akad. Forh., XI, p. 192, 1854.
Megamelus notulus, Fieb. Verh. der Zool. Bot. Ges. Wien, XVI, p. 519, pl. 8, fig. 2, 1866.

Fieb., Cicad. d'Europe, III, p. 9, 1878.
Sahlberg, Cicadariæ, p. 412, 1971.

Liburnia notula, Edwd., Trans. Ent. Soc. London., 1886, p. 62.

Several specimens that correspond in every particular with material of **M. notulus** received from M. Lethierry were taken by me along Muskoka River near Bracebridge, Ont. in July 1888. I have not taken it further south nor has it been recorded from elsewhere in this country. It is evidently rare and probably northern in its range.

Note: Since this was written I have taken a pair among the hills at Colden, N. Y., Aug. 16, 1896. So its southern range must be extended at least to Western New York.

MEGAMELUS PICEUS, Van D.

Davis, Bul. 102 Mich. Ag. Exp. Station, p. 8, pl. 1, fig. 5, 1894. Reprint in Exp. Station Record, V, p 792, 1894.

Van Duzee, Bul. Buff. Soc. Nat. Sci., V, p. 190, 1894.

Piceous-black; base of the vertex, keels and narrow hind edge of the pronotum, disk of the mesonotum, or at least its carinæ, disk of the tergum, especially towards its base and apex, and the edge of the dorsal keel, the genital segments and sometimes the base of the venter, brownish yellow. Face pale shaded to brown above, clypeus deep black. Antennæ, rostrum, tylus and legs pale soiled yellow, the latter lineated with brown. Elytra reaching to the second abdominal segment in the brachypterous form with the apex truncated, piceous-brown or even black, with the apical edge white, more or less broadly interrupted with black at the middle, nervures strong, granulated. In the macropterous form the elytra extend considerably beyond the tip of the abdomen, about as in **Liburnia pellucida**; they are smoky with pale granulated nervures, the exterior and interior of which are forked at about three fourths their length. Pygofers of the male cylindrical, on their ventral aspect cut out for about one half their length and carrying on the base of this incisure a wide and short projection extended into a short conical divergent tooth at each angle; beyond this are the incurved spine-like stiles included between the long slender ventral projections of the plates. Length 2½ to 3 m. m.

New York and Michigan. Described from many examples of both sexes taken in Western New York on grass in low swampy meadows in August and September, and one female taken on celery at Kalamazoo, Mich., August 26th, 1893, by Mr. G. C. Davis.

This description was first published in connection with Mr. Davis' paper on Celery Insects cited above, and reprinted in the Experiment Station Record.

MEGAMELUS MARGINATUS, n. sp.

Yellowish testaceous above, paler beneath. Frontal foveæ with a slender black line next the white carinæ; outer submargin of the cheeks, some marks on the pleural pieces, knees and tips of the tarsi dark brown or black. Venter and pronotum sometimes whitish with the sides of the scutellum yellowish. Abdomen black, the segments edged with fulvous, the apical

ventral segment brown at least on its disc. Eyes black with a fulvous border. Antennæ brown. Elytra whitish-subhyaline, nervures distinct, concolorous. Wings white the nervures brown at apex. In the females the median line of the oviduct and pygofers is testaceous, or pale yellow in one example. Length about 3½ m. m.

In this species the front is rather wide especially in the female, and the black marginal line about the foveæ is quite characteristic.

New York and New Jersey. Described from several examples taken by Prof. J. B. Smith at Anglesea, N. J., May 28th, and near New York City and at Ravenswood, N. Y., Aug. 28th, 1890, by Mr. E. B. Southwick.

MEGAMELUS DAVISI, n. sp.

Near to **M. Piceous** but smaller and more slender.

Macropterous form: Piceous black. Vertex with the lateral carinæ at base and a lozenge-shaped mark on the disc anteriorly, including a black point, pale. Sides, carinæ, and narrow hind edge of the pronotum, and hind edge of the mesonotum, marked more or less with pale; the lateral carinæ of the mesonotum and sometimes the median, marked with fulvous. Face pale; front and clypeus with a black line on either side; a spot below the antennæ another anterior to, and a smaller one above the eye, brown. Basal joint of the antennæ with a brown spot beneath which may extend on to the base of the succeeding joint. Abdomen with some fulvous marks beneath and on the basal segments of the tergum. Breast pale, varied with piceous on the disc of the pleural pieces. Legs pale, tibiæ more or less distinctly twice-banded and the femora feebly lineated with brown; spur white, very large and foliaceous, oblong, obtuse and brownish at apex, its length less than twice its width. Elytra whitish, somewhat clouded on the clavus; nervures pale, distinct, the costal and commissural darker; base of the clavus and a line at its apex black.

Aperture of the pygofers of the male broad, the usual ventral sinus shallow, nearly filled by two stout teeth which become somewhat incurved at apex; the edges of the dorsal pieces touched with yellowish below the short anal tube.

A brachypterous male differs in being mostly pale beneath with the black longitudinal line on either side of the front and clypeus distinct; disc of the pro- and mesonotum between the lateral carinæ pale yellow with two black points behind the vertex. Tergum, excepting segments four and five, largely pale yellow. Elytra covering the second abdominal segment, truncated behind, black with pale nervures. The very young are whitish marked more or less with black on either side of the dorsum and with two brown lines on the front. Length to tip of the elytra 3½ m. m.

Michigan. Received from Mr. G. C. Davis to whom this pretty species is dedicated and who reports it as abundant on water lilies. This is an interesting insect easily distinguishable from all its allies by its large foliaceous spurs at the base of the hind tarsi. It is intermediate in form and size between **M. piceous** and **M. marginatus** but in coloration it is much nearer **piceous** although the elytra are white and want the setigerous gran-

ules on the nervures. In this as in many of our other Delphacids the extent of the pale markings is quite variable in different individuals and the females are proportionately broader than the males.

Is not the large foliaceous spur in this species an adaptation of Nature to enable these insects to leap more readily from the surface of the water about which they make their home?

GENUS PISSONOTUS, n. gen.

Head narrower than the pronotum; vertex hardly prominent before the eyes; front narrow above, much expanded below, the sides arcuated, median carina forked about one third its length below the apex of the head, the two branches subparallel closely approximated for most of their length. Thorax broad across the middle, convex, narrowed anteriorly; pronotum nearly straight across the hind edge, lateral carinæ rather widely divergent at their apex a little incurved, hardly attaining the posterior edge.

This genus seems to be intermediate between **Megamelus** and **Dicranotropis. P. marginatus** and its allies are highly polished little insects, broadest across the base of the elytra which in the brachypterous examples are small, truncate behind, smooth and polished with the nervures nearly obsolete, and the scutellum is unusually small. **P. basalis** has a large scutellum and has much the appearance of a **Kormus,** but the lateral carinæ do not follow the posterior curve of the eyes and the front is much wider below with its median carina distinctly forked some ways below the apex of the head. **P. aphidioides** and its allies are dull brown insects widest across the abdomen, at least in the brachypterous examples which alone are known to me, giving them a strong resemblance to some of the subterranean plant-lice near **Rhizobius.** All the species have the apex of the front pale, and a broad black band crosses the clypeus and the anterior and intermediate coxæ. Some of the species, especially **brunneus,** bear a strong resemblance to members of the genus **Dicranotropis,** and it may be necessary to modify that genus so as to include them when their winged forms are known. For the present these may be distinguished by having a broader front with the forks of its median carina closely approximated below the apex of the head The brachypterous forms of **brunneus, aphidioides** and their allies have strong pale elytral nervures.

The type of this genus is **Pissonotus marginatus.**

1 PISSONOTUS MARGINATUS, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 190, 1894.

Vertex, pronotum and scutellum nearly equal in length, the former almost square, hardly prominent before the eyes, the latter unusually small with the edges nearly rectilinear and the apex but slightly produced. Elytra short, rarely covering the second abdominal segment, cut squarely off behind, almost coriaceous, shining, the nervures nearly obsolete. Abdomen of the female broadly ovate, in the males more slender. Aperature of the pygofers of the male rather broad, superior wall of the anal tube produced in long incurved tusk-like horns that are nearly parallel and rest with their tips against the indented ventral margin of the pygofers; stiles small, incon-

spicuous Color piceous black, head rufous, clypeus black, posterior half of pronotum and broad hind edge of the elytra white. Scutellum and base of the elytra tinged with rufous; breast and legs, except the tibiæ and apex of the anterior and intermediate femora, pale; antennæ dusky. The male has the tip of the clypeus and front, antennæ, legs and breast soiled whitish yellow. The pale margin of the pronotum is very narrow. The vertex and base of the front are piceous and the elytra are paler, almost rufous. Length about 2½ m. m.

Lancaster, N. Y. July and Sept, Described from a single pair. More recently, June 1896, I took a fine female of this species at Hamburgh, N. Y.

2 PISSONOTUS ATER, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 190, 1894.

Form and size of **marginatus**. Deep pitchy black, highly polished, Elytra inclined to piceous-brown. Face piceous becoming more or less flavescent across the apex of the front and cheeks. Antennæ, legs, breast and disc of the venter soiled honey yellow, anterior and intermediate tibiæ and apex of the posterior coxæ embrowned. Length 3 m. m.

Near Buffalo, N. Y. Described from a single female example taken on Grand Island in Niagara River, Sept. 11th, 1892. This species agrees with **marginatus** in most of its characters and may prove to be but a black variety of that form.

Since the above description was prepared I have taken a pair of this species at Hamburgh, N. Y. on the 11th of July. To the characters given I can only add that the base of the tergum shows indications of the paler markings characteristic of the brown forms of this genus and the legs are more deeply colored approaching piceous on the knees. The male is deep black becoming a little pitchy on the elytra and head. The genital segment is long; aperture of the pygofers more strongly constricted a little below the middle and somewhat narrower than in **marginatus**, and the impressed portion of the ventral wall is slightly elevated at either angle and produced in a minute sharp tooth which is not noticeable in its ally.

In both sexes the elytra are highly polished with the nervures indicated by raised points, more conspicuous in the male, in which, also, the apex of the elytra is touched with white at either angle.

This is without doubt quite distinct from **marginatus**. It may be recognized by the narrower front with the median carina prominent for its whole length. In **marginatus** this carina becomes obsolete over the apex of the head.

3 PISSONOTUS DELICATUS, n. sp.

Form of **P. marginatus**, but smaller with the front a little narrower. Color pale honey-yellow; face marked with the usual piceous band which covers the base of the clypeus and crosses the anterior coxæ. Apical margin of the elytra white; apex of the front whitish; knees, tips of the tarsi, a streak on the outer surface of the anterior and intermediate tibiæ, and the extreme point of the oviduct dark brown. Length 2½ m. m.

California. Described from a single female specimen received from Mr. D. W. Coquillett and captured near Los Angeles.

4 PISSONOTUS BASALIS, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 190, 1894.

Macropterous form. Allied to **marginatus** but differs in having the scutellum much larger, about as in **Liburnia pellucida** which this species much resembles. It is however a much stouter insect than the latter and the hind edge of the pronotum is straight. Front narrower than in **P. marginatus,** the median carina distinct. Color piceous black, hind edge of the pronotum broadly white, extreme tip of the scutellum and narrow apex of the front yellowish; front, cheeks and vertex rufo-piceous, breast from the apex of the anterior coxæ to the base of the abdomen, and the coxæ, femora, and hind tibiæ honey-yellow; tarsi whitish at base, the base of the tergum obscurely marked with paler. Elytra and wings whitish-hyaline, smoky at base and slightly clouded at apex. Marginal nervure brown, the others nearly concolorous. Antennæ soiled honey-yellow. Length 3½ m. m.

Described from one female taken at Lancaster, N. Y., July 4th, 1888.

A male from Columbus, Texas, in the National Museum collection apparently belongs to this species. It differs from the female described above in having the face piceous black with a white band across the apex of the front and cheeks, three or four transverse marks and two marginal dots on the basal half of the front, the narrow base of the vertex and a broad band on its apex including two dots, white. The base of the tergum is also marked with yellowish. Pygofers much inflexed below, the aperture broadly ovate, the margins angularly produced inwardly on either side above the middle, forming a blunt tooth.

5 PISSONOTUS PALLIPES, n. sp.

Gillette & Baker, Hemip. of Colo., p. 69, 1895.

Allied to **basalis** but smaller and more slender. Head brownish fulvous; eyes, basal joint of the antennæ and base of the clypeus piceous, the latter polished. Pronotum piceous, the short median carina with a whitish mark, the lateral with a slender pale line. Scutellum piceous-black, the short abrupt tip whitish, the edges narrowly fulvous at base; carinæ paler in the female. Elytra whitish hyaline the marginal nervure and a cloud on the shoulder brown, discal nervures faintly yellowish. Abdomen piceous black, base of the vertex, edges of the genital pieces of the male and the margin of the plates in the female, paler or yellowish. Legs whitish, lineated with brown, tips of the claws brown. Breast whitish marked with a broad piceous band which crosses the base of the coxæ and clypeus. Genital segment of the male long, the aperture rather narrow, the sides produced inferiorly in a rounded lobe slightly incurved over the base of the small stiles. Length about 3 m. m.

California, Colorado. Described from one pair received from Prof. C. P. Gillette, taken among the mountains of North Western Colorado, and two females taken near Los Angeles, California, by Mr. D. W. Coquillett. These latter differ from Prof. Gillette's specimens in having the head darker or almost piceous with a pale band adjoining the base of the clypeus, the base of the vertex also wants the whitish marks.

This species may be distinguished from **basalis** by the piceous pronotum marked with whitish on the carinæ, the shorter scutellum with its abrupt white apex, and distinct carinæ, and the more slender form of the insect

6 PISSONOTUS APHIDIOIDES n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 190, 1894.

Broad oval, widest across the abdomen. Elytra reaching onto the second abdominal segment, the nervures prominent. Color wood-brown inclined to yellowish on the legs and disc of the tergum; pleural pieces and sides of the abdomen obscurely marked with piceous; pronotum and usual transverse band on the face, whitish; the latter followed by a broad piceous band across the base of the clypeus and anterior coxæ. Cheeks marked with an oval black spot below the antennæ. Front with about three transverse pale lines two of which are nearer the base, the other may be reduced to two points adjoining the whitish apical band. Base of the scutellum irrorated more or less with whitish, tibiæ and tips of the tarsi brown. Elytra brown, sub-opake, with paler nervures. In one example the vertex is white with the foveæ and a dot on either side at apex black, and the base of the tergal segments are brownish yellow. Length 3 to 3½ m. m.

New York. Described from two female examples, one taken at Salamanca, August 2nd, 1889, the other at Colden a few days earlier. The latter is a larger and darker specimen bearing a striking resemblance to some of our brown plant lice.

7 PISSONOTUS DORSALIS, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 190, 1894.

Closely allied to the preceding. Dull yellowish brown, paler beneath; broad lateral margin of the tergum, some marks on the connexivum and the base and apex of the pygofers in the female, piceous or blackish. Clypeus deep black with some obscure spots opposite the pleural pieces indicating a transverse band; claws of the anterior and intermediate feet blackish, front paling toward the base of the clypeus, immaculate above. Disc of the tergum quite obviously tinged with yellow. In the male the front, vertex and elytra have a reddish cast with the apical margins of the latter whitish, the nervures concolorous. Aperture of the pygofers in the male broadest below the middle, the stiles short and curved, their slender acute points approximated above, their base surrounded by the long curved ventral prolongation of the outer superior angles of the pygofers. Length about 3 m. m.

New York. Described from one pair captured in July, at Lancaster and Colden. This species may be distinguished from the preceding by the paler yellowish dorsum, and the brown, almost immaculate, front.

8 PISSONOTUS BRUNNEUS, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 190, 1894.

Allied to **P. aphidioides** but much smaller. Color piceous brown tinged with rufous on the front; breast soiled yellowish white, marked by the usual broad piceous band which crosses the clypeus and curving backward on either side covers the anterior and intermediate coxæ and terminates in a cloud on the post-pleura. Carinæ paler than the adjacent surface, narrow

apical margin of the front and outer edge of the cheeks whitish. Elytra fuscous with prominent whitish nervures. Disc of the tergal segments sometimes paler and there may be a longitudinal row of pale spots, more or less continuous, on either side of the middle of the venter, edge of the plates and a line on the oviduct pale. Antennæ brown, the basal joint black. Eyes edged with pale. Length 2½ m. m.

New York. Described from six female examples, four taken near Buffalo in September, and two from New York City taken by Mr. E. B. Southwick in June. One of the latter is unusually dark with the pale markings much reduced in extent and the legs black.

Superficially this insect resembles **Phyllodinus nervatus** but the head is narrower than the pronotum, the legs are not strongly flattened, the cheeks are narrower toward their apex and the lateral carinæ of the pronotum do not reach the hind margin.

GENUS DICRANOTROPIS, Fieb.

Fieber, Ver. der Zool. Bot. Ges. Wien, XVI, p. 521, 1866.
" Cicad. d'Europe, I, p. 91, 1875; II, pl. 8, 1876.
Sahlberg, Cicadariæ, p. 469, 1871.
Mayr, Tabellen, I, p. 21, 1884.
Edwards, Trans. Ent. Soc. Lond., 1886, p. 92.
Ashmead, Ent. Am., V, p. 27, 1889.

DICRANOTROPIS MAIDIS, (Ashm.)

Delphax maidis Ashmead, Psyche, V, p. 323, 1890.

It is with some misgivings that I refer this species to **Dicranotropis.** The front is not at all narrowed toward the apex but the sides are sharp and parallel to a point opposite the lower angle of the eyes; here the median carina is forked, the two branches being well separated and a little divergent where they pass over the rounded apex of the head. The general color is fulvous brown becoming darker on the front, pleural pieces and femora. The abdomen is brown with the segments edged with pale and the carinæ above are paler. The elytra are more than twice the length of the body, whitish hyaline with yellowish nervures, those at the apex margined with smoky, especially toward the inner angle; and on the commissural nervure just before the apex of the clavus is a fuscous line.

Several specimens of this species were in the box received from the National Museum. They are from Florida and Columbus, Texas. Mr. Ashmead's description referred to above is quite accurate and full.

GENUS PHYLLODINUS, n. gen.

Form short and stout, square before. Head wider than the pronotum. Vertex quadrangular, a little wider than long, passage to the front strongly rounded. Front broad, base and apex nearly equal, the sides feebly convex; median carina forked opposite the middle of the eyes. Clypeus tricarinate. Cheeks narrow, broad at apex, the edges almost parallel below the inner angle of the eyes. Eyes large, transverse, deeply excavated below. Anten-

næ stout, the two basal joints about equal in length. Pronotum short, anterior edge straight between the eyes, posterior very feebly excavated, lateral carinæ following the contour of the eyes. Scutellum short. Elytra in brachypterous form with strong reticulated nervures. Anterior and intermediate feet with the posterior coxæ strongly flattened, the femora deeply sulcate within. Posterior tibiæ bispinose.

PHYLLODINUS NERVATA, n. sp.

Eurysa nervata, Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 191, 1894.

Form oblong, broad and short. Head wider than the pronotum, vertex nearly square, a little transverse, the edges nearly rectilinear, the anterior fova long-triangular, reaching over the rounded anterior edge of the head. Front oblong, a little expanded opposite the lower angle of the eyes; middle keel distinct for its whole length on the front but obsolete on the base of the clypeus. Pronotum shorter than the vertex, the fore and hind margins nearly straight and parallel, lateral carinæ much curved. Sides of the large scutellum concave, the lateral carinæ straight and oblique; near theb asal angles. Elytra short and broad, covering the fifth abdominal segment, rounded behind. Pygofers of the male compressed laterally, the aperture narrow, forming a rounded pocket below to enclose the short slender curved stiles, which are approximated but do not quite touch at their tips. Wall of the anal aperture square and produced on the ventral aspect, the lower angles acute and nearly touching one another. Femora and tibiæ of the anterior and intermediate feet t1 1 and broadly expanded. Length 2½ to 3 m. m.

Color piceous brown. Vertex pale, a short anterior median line and a row of dots on either side brown; disc of the pronotum and its carinæ pale; scutellum pale with the basal angles and a double median line brown. Elytra subhyaline, smoky, with numerous heavy ramous white nervures. Front blackish with the carinæ and a double row of dots on either side pale. Carinæ of the clypeus in part, rostrum, excepting its tip, edges of the femora, and tips of the tibiæ, some marks on the pleural pieces, sternum and coxæ below, and the apical joint of the antennæ, pale. Disc of the tergum in the females tinged with reddish with a more or less complete double row of pale spots on either side. Tip of the genital pieces and the oblong plates at the base of the oviduct in the females whitish. Deflexed sides of the pronotum expanded into a large white plate at the base of the elytra.

New York and Canada. Not uncommon near Buffalo on damp weedy meadows in June. Also taken in Welland Co. Ont. and at Muskoka Lake in July. This is our largest northern Delphacid. Its square form and brown color with the strongly ramously veined elytra will distinguish it.

LACCOCERA, new genus.

Allied to **Delphacinus** and **Eurysa.** Head large, a little wider than the pronotum. Vertex nearly square or somewhat five-sided, a little surpassing the eyes before. Front broad, six-sided, distinctly angled between the eyes; apex but little narrower than the base; passage to the front strongly

angled; median carina distinct, forked at the apex of the head, the lateral compartments with a few large pustules. Pronotum short, deeply excavated behind; lateral carinæ strongly curved behind the eyes, pustulate. Scutellum large, distinctly constricted before the apex; lateral carinæ but feebly divergent posteriorly. Anterior and intermediate tibiæ flattened, not foliaceous expanded; hind tibiæ armed, the tarsi short.

This genus is, perhaps, nearer to **Eurysa** Fieb. but the carinæ are more distinct, the passage from the front to the vertex is more acute, the pronotum is more deeply excavated behind, and the front, vertex and sides of the pronotum and abdomen are ornamented with large excavated pustules. It differs from **Phyllodinus** in the simple anterior and intermediate tibiæ, the form of the front, the more deeply excavated hind edge of the pronotum, the smaller antennæ with shorter basal joint, and the pustulated ornamentation which recalls **Achorotile.** **Laccocera obesa** is hardly characteristic of this genus and may not belong here. **Laccocera vittipennis** is the type.

LACCOCERA VITTIPENNIS, n. sp.

Delphacinus, Gillette & Baker, Hemip. of Colo., p. 69, 1895.

Head a little broader than the pronotum, blunt before; vertex nearly square, very slightly angled before, the hind edge rectilinear between the eyes; apical fovæ oblong, rounded before and behind. Front parallel above, tapering rapidly below; median carina strong and distinct throughout, each compartment with about seven pustules, two near the apex, two at base, and three smaller ones along the outer margin above the middle. Pronotum shorter than the vertex; deeply and angularly excavated behind, lateral carinæ strongly curved, extending over onto the deflected sides and marked by a row of small pustules. Scutellum large, lateral carinæ but slightly divergent. Length 4 m. m.

Color: Head pale yellowish; cheeks, clypeus and outer margins of the front, black, carinæ and pustules pale; outer apical angles of the vertex with a row of shallow pustules which contain each a black dot. Pronotum whitish, with a dusky cloud below the eye divided by the lateral carina. Scutellum bright fulvous, outer compartments black, edged behind with fulvous; the median carina sometimes pale. Elytra much exceeding the abdomen in length; whitish vitreus with a broad smoky vitta on either margin at apex, the inner prolonged as a fainter stripe along the sutural margin of the corium to the base; nervures slender, brown. Wings white with brown nervures. Breast yellowish; coxæ and legs black, edges of the femora and the anterior and intermediate tibiæ, the basal joint of the hind tarsi and the posterior tibiæ yellow. Abdomen black, inner margins of the plates of the female whitish, edge of the oviduct and disc of the pygofers fulvous. The front is sometimes blackish to the base, and the pleural pieces may be more or less invaded with black; antennæ black.

The male has the head and pronotum soiled whitish with the clypeus and apex of the front blackish; antennæ pale; cheeks and legs fulvous; coxæ and disc of the pleural pieces black. Elytra smoky at base becoming vitreous toward the apex with strong brown nervures. Aperture of the

pygofers nearly square above and below, suddenly expanded about the middle at the tips of the long curved dorsal hooks; styles broad, approximate at base, curved outward and becoming nearly parallel and pointed above.

New Hampshire, Colorado. Described from three female examples taken on Mt. Washington by Mrs. Annie Trumbull Slosson, and one pair from the mountains of North West Colorado, collected by Prof. C. P. Gillette. One of the females from Mt. Washington is more clearly marked than the others; the pronotum and scutellum are white on the middle marked with black on the sides and the breast is black, otherwise it does not differ from typical specimens.

LACCOCERA ZONATUS, n. sp.

Delphacinus zonatus, Gillette & Baker, Hemip. of Colo., p. 69, 1895.

Brachypterous Male. Deep shining black. Front, vertex pronotum and scutellum tawny yellow or whitish; face fulvous; feet light orange, the tarsi paler tipped with brown; tergum marked with a transverse band on the second and third segments which may invade the base of the fourth. Elytra short, truncated behind, reaching onto the second abdominal segment, nervures simple, strong. Apex of the ample pygofers broad below with a transverse oblong excavation bounded by an incurved tooth on either side. Styles approximate at base, quite widely spreading, reaching about half way to the anal tube the ventral wall of which is broadly expanded and produced at the outer angles into a long acute tusk-like fulvous tooth.

Macropterous female: Soiled yellowish white; an oblong spot on either side of the base of the scutellum, a cloud on the pleural pieces, the lineations of the femora and the metanotum, brown. Tergum black, a large spot on the basal disc, a row of about four pustules on either side of the middle on each segment and their narrow edges pale. Elytra and wings well developed, vitreous with strong brown nervures. Length 2½ to 3½ m. m.

In both sexes the head is very large, wider than the thorax; the eyes are large overlapping the pronotum for one half their length. Vertex cut squarely off behind, anteriorly extending for nearly one half its length before the eyes and but little produced at the middle, the edge almost rounded before, carinæ distinct, forming a large triangle with its apex at the tip of the head, the contained foveæ strongly marked. Front broad, but little narrowed at apex, the middle carinæ distinct. Pronotum angularly excavated behind for one half its length. On the front are three pairs of pustules, one pair placed near the middle of the outer edge and smaller; a row of pustules follows the curved pronotal carinæ and there is another below the carinated outer edge of the front, and a smaller pair occupy the outer angle of the vertex.

Colorado. Described from a single pair received from Prof. C. P. Gillette.

Since the above was written one macropterous and ten brachypterous males have been received from Prof. Gillette. The former differs from the

brachypterous form only in having a blackish oblong spot within the basal angles of the scutellum. The elytra are long as in the female but of a pale smoky brown with darker nervures.

LACCOCERA ? OBESA, n. sp.

Delphacinus obesa, Gillette & Baker, Hemip. of Colorado, p. 69, 1895.

Macropterous female: Allied to **vittipennis** but broader and stouter with the head narrower than the thorax, the eyes smaller and the elytra shorter and broader at apex.

Vertex nearly square, broadly rounded before, not obviously five angled; basal foveæ shorter than in **zonatus,** more as in genus **Delphax,** reaching only to the middle, before forming two middle keels which run nearly parallel over the apex of the head and unite abruptly to form the middle keel of the front. These carinæ form three oblong nearly equal compartments on the apical half of the vertex. Hind edge of the pronotum broadly sinuately excavated across the middle, including a slight median emargination; the fore and hind margins nearly parallel.

Color soiled yellowish white, fulvous on the scutellum. Eyes, clypeus, its carinæ excepted, and the disc of the pleural pieces blackish. Tergum marked as in the female of **zonatus.** Venter fulvous dotted with brown; oviduct brown, shorter than the pygofers, the latter pale with a brown dot at the inner apical angle. Length 3½ m. m.

Colorado. Described from a single female specimen received from Prof. C. P. Gillette. This is a stouter species than **zonatus** with which it agrees closely in color and markings. It has the same arrangement of pustules on the head and pronotum, but the carinæ on the vertex are differently placed.

GENUS STOBERA, Stal.

Berliner Ent. Zeits., III, p. 327, 1859.

"Caput thorace nonnihil angustius, truncatum; vertice transverso; fronte elongata, subparellela, marginibus carinatis, medio carina percurrente, basi ipsa furcata instructa; genis obliquis, triangularibus, haud parallelis; clypeo tricarinato. Antennæ compressæ, capiti transverso cum oculis vix æquilongæ, articulo ultimo penultimo longiore. Thorax brevis, postice late emarginatus, tricarinatus, carinis lateralibus posterius leviter divergentibus. Tegmina abdomen multo superantia. Tibiæ posticæ bispinosæ. **Amblycoti** affine genus."

The above is a copy of Stal's description. The characters given below were prepared by me before I had discovered that this genus had already been defined.

Allied to **Conomelus** Fieb. Head considerably narrower than the pronotum. Vertex short, the carinæ sharp and prominent over the apex of the head. Front narrow, ligulate, but little or not at all narrowed at base, sides nearly rectilinear, carinæ prominent. Cheeks broad triangular, the outer edge a little reflexed. Clypeus long, acutely triangular, distinctly tricarinate. Antennæ stout, reaching onto the base of the clypeus; first

joint broadly flattened, narrowed to the base, the apex oblique; second joint larger, subterete, nearly as wide as the first; its surface, except at base and the outer edge of the first joint coarsely papillated. Pronotum deeply excavated behind, strongly carinated, the lateral carinæ distinctly incurved at apex. Sides of the scutellum strongly concave, the apex prominent, large. Elytral nervures setigerous-punctate.

This genus is near **Conomelus** Fieb. but differs in the form of the front; the antennæ have the same shape but are more flattened, and the carinæ are more prominent. The lateral carinæ of the pronotum apparently fork behind, sending one branch to the posterior edge and another behind the eye as in **Liburnia.** Certainly this is the case in our common **tricarinata,** Say.

STOBERA TRICARINATA, (Say.)

Delphax tricarinatus, Say. Jl. Acad. Nat. Sciences. Phila. IV, p. 337, 1825. Complete Writings, II, p. 225.

Uhler, Bul. U. S. Geol. & Geog. Surv., II, p. 352, 1876.

Van Duzee, Psyche, V, p. 389, 1890.

Osborn, Proc. Iowa Acad. Sci., I, pt. II, p. 127, 1892.

Conomelus tricarinatus, Van Duzee, Bul. Buf. Soc. Nat. Sci., V., p. 191, 1894.

Gillette & Baker, Hemip. of Colo., p. 69, 1895.

Color pale yellowish white, vertex and scutellum fulvous, apex of the head with a brown band between the eyes and invading the base of the front. A broad black band crosses the apex of the front and cheeks and a more slender one the base of the clypeus. Apex of the clypeus, femora below and the coxæ dotted and the tibiæ twice banded with black. Antennæ and outer edge of the scutellum dusky. Disc of the tergum and ventral segments black. Elytra whitish hyaline, nervures, the marginal excepted, with black setigerous dots. Base of the clavus, an oblique band before the middle, another across the base of the apical areoles which is deflected so as to cover the inner half of the membrane, and a triangular spot on the outer apical angle, brown. Where the apical nervures terminate in the brown cloud they are marked by a white spot one of which is larger. Length about 4 m. m.

This is a widely distributed species in North America occurring from Quebec to Mississippi and California. In Western New York it is occasionally taken in damp situations from May to August. I have also taken it near Ridgeway, Ont and have received specimens from New Jersey, (Smith), Mississippi (H. E. Weed), Kansas, (Snow), Colorado, (Gillette), Iowa, (Osborn), California, (Coquillett), and Virginia, Oct. 3d and 23d, Columbus. Tex., June 6th, (U. S. Natl. Mus.), Mr. Uhler records it from Illinois, Nebraska and Missouri, and Say's specimens were from Missouri. In the mountains of Colorado and California a shorter winged form seems to predominate. The extent of the dark markings is subject to some variation in this species.

STOBERA CONCINNA, Stal.

Delphax concinna, Stal, Of. Vet. Akad. Forh. XI, p. 246, 1854.

Stobera concinna, Stal, Berl. Ent. Zeits., III, p. 327, 1859.

"Fusco-testacea (♂), vel pallida (♀); fascia lata frontis genarumque, maculis marginalibus abdominis parvis, pedibusque pallidis, his nigro-annulatis; tegminibus vitreis, fascia obliqua ante medium, fasciis 2 opposite obliquis, una mox pone medium, altera prope apicem, ad commisuram conjunctis, fusis; venis fusco-punctatis. Long. cum tegm. 4½ millim. Patria: Mexico."

This probably is not distinct from the preceding but I refrain from uniting them at present on account of Stal's note appended to his later description which reads: "Adset in Museo Berolinensis species e Pensylvania **S. concinnæ** maxime affinis et similis." Assuming this note to refer to **tricarinata,** which is more than probable, it is evident that Dr. Stal considered this a distinct but closely allied species. So that it seems advisable to retain both names until the question can be settled by the study of a wider range of material than is now at my disposal.

STOBERA BIFASCIATA, (Prov.)

Delphax bifasciata, Prov., Pet. Faune Ent. du Can., III, p. 337, 1890.

This is without doubt but a slightly immature form of **tricarinata.** Were it not for Provancher's remark—"son front est blanchatre" I would not hesitate for a moment to place it as a synonym of that species. I have seen unquestionable specimens of **tricarinata** that agree with his description in every respect except the pale front.

GENUS LIBURNIA, Stal.

Stal, Hemipt. Africana IV, pp. 176 and 179, 1866.

Sahlberg, Cicadariæ p. 422, 1871.

Fieber, Cicad. d'Europe I, p. 89, 1875; II, pl. 8, 1876.

Edwards, Trans. Ent. Soc. Lond., 1886, p 51.

Delphax, Fieber Ver. der Zool. Bot. Ges. Wien, XVI, p. 520, 1866.

Amyot & Serv., Hemipt. p. 512, 1843. (in part)

Berg, Hemipt. Argent. p. 223, 1879.

Mayr, Tabellen I, p. 20, 1884.

Ashmead, Ent. Am. V, p. 26, 1889.

Prov., Pet. Faune Ent. du Can. III, p. 223, 1889.

Stal in 1866 first restricted the genus **Delphax** to **clavicornis** and its allies, on the ground, apparently, that **clavicornis** was the first species described by Fabricius under this generic name and therefore should be considered the type; thus making **Delphax** synonymous with **Asiraca** and displacing the latter generic name. Many European Hemipterists still retain the name **Delphax** for the present genus. But **Delphax** has long been em-

ployed so loosely for most any species of this family that a desire for greater precision would seem to call for the use of Dr. Stal's name even if it were not fully justified by the rules of nomenclature as now most generally understood and adopted. Certainly no exception should be made in this case for the sake of perpetuating Fabricius' name by its application to the larger genus.

LIBURNIA ORNATA, (Stal.)

Delphax ornata, Stal, Berliner Ent. Zeits. VI, p. 315, 1862.

Liburnia ornata, Osborn, Proc. Iowa, Acad. Sci., I, pt. 2, p. 127, 1891.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 191, 1894.

Fulvous-brown, brighter above; vertex, pronotum and scutellum with a white median line which is bordered by a slender black line forming a continuation of the black frontal fovæ over the apex of the head. Frontal carinæ heavy, white. A longitudinal line behind the eye, the pleural pieces and the abdomen black, the latter with some fulvous spots on the margins, and the hind edges of the ventral segments may be pale. Elytra whitish hyaline; a large spot near the base of the corium and a broad V shaped band beyond the middle having its apex on the inner edge near the tip of the clavus, brown. Nervures on the apical half brown and brown-margined, on the base dotted, concolorous on the brown basal spot. Front and clypeus narrow, ligulate. Vertex rectangular, scarcely prominent before the eyes. Length 4 m. m.

This is a widely distributed and pretty species recalling by its orna mentation **Stobera tricarinata.** Stal records it from South Carolina and New York. Prof. Herbert Osborn has taken it in Iowa in September. Mr. H. E. Weed has sent me specimens from Mississippi and Mr. W. J. Palmer, Jr. of Buffalo has taken it in the mountains of North Carolina in July. About Buffalo it is rare. I have taken one specimen here on grass in June.

LIBURNIA PELLUCIDA, (Fab.)

Fulgora pellucida, Fab. Ent. Syst , IV, p. 7, 1792.

Delphax pellucida, Fab. Syst. Rhyng., p. 84, 1803.

Germar, Mag. der Ent., III, p. 212, 1818.

Burm., Handb. der Ent. II, 1, p. 150, 1835.

Stal, Of. Vet. Akad. Forh., XI, p. 193, 1854.

Fieb. Verh. der Zool. Bot. Ges. Wien, XVI, tafl. 8, fig. 20, 1866.

Liburnia pellucida, Fieb. Cat. der Cicad. p. 5, 1871.

Fieb. Cicad. d'Europe IV, p. 4, 1876.

Sahlberg, Cicadariæ p 436, 1871.

Harrington, Ottawa Nat., VI, p. 31, 1892.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 191, 1894.

Macropterous males: Color black; carinæ of the head broadly white; pronotum white clouded anteriorly between the carinæ, or the surface may be more or less obscured with blackish; scutellum shining black edged with

fulvous; antennæ pale; connexivum and narrow margin of the ventral segments and pleural pieces whitish. Elytra fuliginous; forks of the first and second sectors nearly equal; nervures sparingly punctate; pale at base. Legs pale, femora and outer face of the tibiæ more or less embrowned, Pygofers broad, aperture transverse, narrowed dorsally, ventral notch broad, moderately deep; stiles rather slender, acute, very widely divergent, almost horizontal; the pygofers edged with white.

In the brachypterous males the disc of the scutellum is sometimes pale and the pale markings on the abdomen are more extended.

The brachypterous females are pale brownish yellow, deeper colored on the scutellum and venter; pronotum whitish; tergum and venter sometimes marked with black.

This insect is apparently indigenous to all the northern countries of the globe. It is found throughout Europe, extending its range in the north from Scandinavia through Russia and Siberia to Kamshatcha, and on this continent has been reported from Alaska, British America, Canada and the Eastern United States generally. About Buffalo it is our most abundant Delphacid, occurring through the entire season, frequently in large numbers

Delphax arvensis Fitch is probably only the female of this species **Delphax furcata** Prov. seems to differ in being larger and having a black oviduct. It may be distinct. A few references for these names follow:

LIBURNIA AVENSIS, (Fitch.)

Delphax arvensis, Fitch, Homop. N. Y. State Cab., p. 46. 1851.

Reprint in Lintner's 9th Rept., p. 386, 1893.

It seems impossible to positively identify this form. Several examples of what I formerly placed under **arvensis** have been taken about Buffalo from May to Oct. These I now believe to be the macropterous females of **pellucida.** They are of a pale soiled yellow color, the elytra are tinged with fulvous with strong fulvous nervures. In some examples there are a few black marks beneath and the front may be more or less obscured.

LIBURNIA FURCATA, (Prov.)

Delphax furcata, Prov. Nat. Canadien, IV, p. 320, 1872.

Prov. Pet. Faune Ent du Can., III, p. 225, 1889.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 191, 1894.

A larger form closely allied to the preceding I placed under this name in my list of the Hemiptera of Buffalo. It agrees with Provancher's description in the size but wants the brown oviduct, This name should, perhaps, be placed as a synonym of the foregoing.

LIBURNIA DETECTA, n. sp.

Macropterous form: Broad and stout Color soiled whitish; basal angles of the scutellum and beneath, especially in the female, quite strongly tinged with yellow. Face black; a longitudinal line in the middle of each

compartment of the front and a shorter one on the cheeks fulvous, carinæ white; basal foveæ of the vertex pale, base of the scutellum, disc of the pleural pieces, some marks on the base of the vertex in the male, and the claws, blackish. The black on the base of the scutellum is mostly covered by the pronotum but on either side it is extended backward as a black line next to the patagia. Tergum black, the broad margins and a transverse band near the apex whitish in the male, fulvous in the female. Elytra whitish, nervures concolorous, the marginal heavy and brown around the apex; the inner apical areoles with a faint longitudinal fuscous cloud. Tips of the last segment of the connexivum black in the female. Length, male 3½, female 4 m. m.

The genital characters of the male are similar to those of **pellucida**; stiles quite broad, widely divergent, their apex rounded and a little twisted. All the pieces black except the edge of the anal tube.

New York. Described from one pair received from Mr. E. B. Southwick, taken in New York City.

LIBURNIA CONSIMILIS, n. sp.

Gillette & Baker, Hemip. of Colo., p. 69, 1895.

Form and aspect of **L. pellucida**. Black; all the carinæ, the broad posterior margin of the pronotum, feet, mostly, and the narrow margins of the abdominal and pleural pieces, white; elytra faintly fuliginous, nervures brown. Length 4 m. m.

Macropterous male: Compared with the male of **pellucida** the vertex is a little longer, the basal foveæ distinctly longer, the apical smaller and the posterior margin of the vertex more distinctly emarginate. The front is proportionately a little broader than in that species, the lateral carinæ are more distinctly arcuated, the apical joint of the antennæ is smaller, the pronotum is shorter, the hind edge a little more deeply excavated and the apex of the scutellum is broader and shorter.

Color black; carinæ of the head and pronotum narrowly white, tegulæ and broad margin of the pronotum white; edge of the scutellum touched with fulvous on its middle; connexivum and narrow margin of the ventral segments and pleural pieces whitish; legs brown, base and apex of the femora tip of the tibiæ and the tarsi soiled white, the latter tipped with black. Elytra extending one half their length beyond the abdomen, very faintly smoky, nervures brown; wings white, nervures brown.

Genital segment of the male long; aperture similar in form to that of **pellucida** but smaller with the styles narrower and less widely spreading, ventral notch of the pygofers small.

I have given a comparative description of this species as best suited to distinguish it from the closely allied **pellucida** with which it might very readily be confounded, the form of the male genitalia is however very different, the insect is broader and has a wider front and vertex, and the male and female scarcely differ in color. The latter has the femora pale lineated with brown and the elytra are darker with stronger nervures.

California and Colorado. Described from three males from near Los Angeles, Calif. received from Mr. D. W. Coquillett under the name of **Delphax consimilis,** Uhler, M. S. and one pair taken in the mountains of north west Colorado by Prof. C. P. Gillette.

LIBURNIA, PUELLA, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 191, 1894.

Aspect of the male of **L. pellucida** but smaller with a double piceous mark at the tip of the clavus.

Macropterous form. Male: Black; carinæ of the head and the posterior half of the pronotum white; tip of the scutellum, broad margins of the propleuræ, antennæ, legs, connexivum and narrow margins of the ventral segments, yellowish testaceous, the latter sometimes white. Elytra pellucid white, tip of the clavus and the marginal nervure of the membrane blackish; discal nervures pale brown, finely granulated.

Vertex longer and narrower than in **pellucida;** front narrower, the sides parallel below the eyes where the width is hardly greater than at the center of the eye. Aperture of the pygofers almost circular, a little arcuated below; stiles widened and converging above, the outer angles extended upward and backward toward the anal aperture. Length 2½ m. m.

In the female the yellowish markings are more extended, the front is slightly widened toward the clypeus with its carinæ yellowish instead of white; the pronotum is black with the carinæ and narrow posterior margin pale yellow, otherwise like the male. Pygofers long and narrow, parallel; plates narrow, arcuated within, covering the pygofers to the base of the broad oviduct. Length 3 m. m.

New York, New Jersey, Mississippi, Iowa. Described from numerous individuals of both sexes. About Buffalo this species is rare but it becomes more abundant southwardly where it seems to replace **pellucida.**

LIBURNIA OSBORNI, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 191, 1894.

Macropterous form. Resembles **L. ornata,** Stal in form and size. Color soiled whitish tinged with yellow beneath; scutellum bright fulvous. Elytra white, subhyaline, nervures pale at base, becoming fuscous at apex. Wings white with slender brown nervures. Eyes, ocelli and tips of the tarsi and rostrum black. Length 3 to 4 m. m.

The male has a conspicuous oblong longitudinal black spot within the basal angles of the scutellum and a whitish median carina. The disc of the pleural pieces and the abdomen, its margins and a part of the basal and genital segments excepted, are also black, and the front has a darker border within the lateral carinæ. In the female the color of the abdomen and breast is bright fulvous like the scutellum and sometimes the metanotum and disc of the tergum is blackish.

Apex of the pygofers in the male nearly circular; their surface below exposed by the strongly angled last ventral segment; stiles hook-shaped, approximate at base then curved outward and upward, their apices twisted and parallel and attaining the anal aperture either side of a ventral arcuation. Pygofers of the female oblong, oviduct stout, brownish, considerably exceeded by the anal tube.

This is a very clearly marked and pretty species of which seventeen specimens are now before me, all macropterous. Ocean Co. New Jersey in May, Prof. J. B. Smith; Agricultural College, Mich. G. C. Davis; Fairfax and Ames, Iowa, Prof. Herbert Osborn, to whom this species is respectfully dedicated. Also taken by me at Lancaster, N. Y. in August 1880.

LIBURNIA LAMINALIS, n. sp.

Macropterous female: Color bright fulvous yellow; above marked with a broad brown band behind the eyes which covers the sides of the pronotum and the basal angles of the scutellum to the lateral carinæ. On the pronotum this brown color may be deepened to black anteriorly within the curve of the lateral carinæ. Face brown, varied with paler and clouded with blackish next to the outer margin of the cheeks, on the base of the clypeus and the base and apex of the front. Color paler beneath becoming soiled whitish on the legs and venter; mesopleura with a round black spot; edges of the ventral segments and their stomata brown; tergum black, the lateral edges and more or less of the apical segment yellowish. Elytra whitish hyaline, the nervures brown, conspicuous, the costal beyond the stigmata heavy and blackish. Anal tube black. Outer edges of the tibiæ with a brown line. Oviduct short, not attaining the apex of the pygofers.

Macropterous male; Colors paler becoming soiled whitish on the pronotum. The face is more strongly colored or almost blackish and the base of the tergum bears a pale band. Pygofers white with a large black spot on each side; stiles and anal tube deep black, the former large, projecting and very conspicuous, with the rounded apex rather broad and obtusely angled within. Length about 3¼ m. m.

In most of its characters this species agrees very closely with **Osborni** but the stiles of the male are much larger and more conspicuous and their apex is more extended and oblique, and viewed from below they are less divergent. The female of **Osborni** has the pronotum immaculate. The basal angles of the scutellum are marked with black in the male only. The front in **laminalis** is narrower, but very little wider toward the base and distinctly arcuated at the apex of the head between the eyes. In **Osborni** the front is one half wider than in the present species with the sides quite distinctly arcuated and but slightly contracted at the tip of the head and the mesopleural spot is larger and more diffuse.

Mississippi. Described from one male and two female examples received from Mr. Howard Ewarts Weed. The females were labeled "Sept. 1892."

LIBURNIA LUTULENTA, n sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 191, 1894.

Brachypterous form; Dull testaceous brown, more or less obscured on the pro- and mesonotum, elytra, and edges of the pectoral pieces, especially in the male; postpectus with a large fuscous spot; facial carinæ brown-margined; abdomen darker, in the male tinged with rufous, the segments edged with fuscous; femora obscurely lineated with brown; tip of the tarsi and rostrum blackish; antennal setæ black.

Vertex quadrate, feebly rounded before, carinæ obtuse, evanescent on the forehead, fovæ each with a round impressed dot. Front rather broad, narrowed between the eyes and more feebly toward the truncated apex. Pronotum shorter than in **lineatipes** and rounded anteriorly, not apparently squared as in that species. Fork of the outer sector of the elytra about twice the length of that of the inner. Pygofers of the male short, aperture subtriangular, the sides rounded, hardly notched above, ventral notch feeble; stiles narrow, claw-like, approximate at base, slightly divergent above and acute at apex. In the female the genital pieces differ from those of **lineatipes** only in being proportionately a little narrower throughout. Length 2 m. m.

New York. Described from six male and eight female examples, taken at Buffalo, May 4th to July 10th and Portage Falls, May 30th.

This insect approaches **L.obscurella,** Boh. but it is only about one half the size of that species and the form of the front and the characters of the male genitalia are quite different. It is also allied to **L. lineatipes.** It is not uncommon in spring on grass in damp situations.

LIBURNIA WEEDI, n. sp.

Macropterous male: Form rather broad and stout. Color soiled brownish testaceous, a little darker on the front and scutellum. Eyes, ocelli and abdomen black, the hind angle of each segment of the latter yellow. Elytra twice the length of the abdomen, whitish hyaline with heavy brown nervures. Genital segment long, aperture nearly round but forming a small notch below; stiles concentric with the outer rim of the aperture, widened and slightly bifurcated above. The genital characters are very obscure in this specimen and are not satisfactorily made out here. Length about 3½ m. m.

Mississippi. Described from a single male example received from Mr. Howard Ewarts Weed. This is an obscurely marked species but quite distinct from any other known to me. It has much the color and general aspect of the smaller northern **lutulenta.**

LIBURNIA OBSCURELLA, (Boh.)

Delphax obscurella, Bohem., Vet. Akad. Handl., 1847, p. 53.

Stal, Of. Vet. Akad. Forh., XI, p. 195, 1854.

Fieb., Verh. der Zool. Bot. Ges. Wien, XVI, tab. VIII, fig. 29, 1866.

Mayr, Tabellen, I, p. 21, 1884. (mention)

Liburnia obscurella, Fieb. Cicad. d'Europe, IV, p. 20, 1876.

Sahlberg, Cicadariæ, p. 443, 1871.

Edwards, Trans. Ent. Soc. London, 1886, p. 80.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 191, 1894.

Several examples of this plainly colored little insect from Western New York have fallen into my sweep-net as the following dates will show:— Colden, July; Concord and Portage Falls, May. It much resembles our common **lutulenta** but may be distinguished by its larger size, (full 2½ m.m. to the tip of the abdomen), its narrow front with black foveæ, and the elongated apical fova of the vertex which brings the fork of the median carina well on to the base of the front.

LIBURNIA LATERALIS, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 191, 1894.

Brachypterous form: Vertex, length and breadth subaequal, carinæ prominent and acute on the forehead, basal foveæ short and shallow, hardly distinct; apical fova elongated, extending over the apex of the head. Front rather narrow, sides straight and parallel below the eyes, contracted above. Clypeus slightly tumid and blackish at base with pale carinæ. Elytra attaining the penultimate segment of the abdomen, narrowed to the rounded apex, forks of the first and second sectors about equal, middle apical areole much the largest. Length 2 to 2½ m. m.

Male. Dull pale yellow, obscured on the sides of the pro- and mesonotum, front and abdomen ochreous; plates and a rather broad vitta on the tergum either side of the middle black; feet whitish with a slender brown line exteriorly. Pygofers, viewed from the side, with a prominent tooth above, below which the edge is cut out almost to the corner of the last abdominal segment; viewed from behind the aperture of the pygofers is oval, slightly wider above, with a broad black transverse band below the anal tube; stiles broad, rounded at the apex, slightly concave on the inner margin, reaching the rim of the anal tube just below the prominent lateral teeth.

Female. Dull yellowish brown; front dusky with a row of pale dots between the carinæ; a large spot at the base of the hind legs and the margins of the abdominal segments, especially towards the sides, black. Elytra fulvous brown, the extreme edge paler, within which is a dusky line. Pygofers long, a little narrowed at the apex, ventral margin of the anal tube feebly concave; plates white.

New York. Described from one male and three female examples taken at Lancaster on August 24th and September 10th, 1889. Another female was captured at Colden, N. Y., August 16, 1896.

LIBURNIA KILMANI, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 191, 1894.

Brachypterous form. Vertex quadrangular, carinæ obtuse, distinct on the forehead, basal foveæ short, dividing carina nearly obsolete; apical fova

long, extending well on to the base of the front. Front wide at the apex, contracted between the eyes, sides almost parallel in the male, in the female widened to below the middle. Antennæ short, reaching the base of the clypeus. Pronotum rather deeply concave behind. Elytra reaching the middle of the abdomen in the female, equalling the abdomen in the male, fork of the first sector longer than that of the second. Length, male 2 m.m., female 3 m. m.

Male: Dull brownish yellow, obscured behind the eyes and on the face, with a clearer dorsal vitta from the vertex to the tip of the abdomen. Abdomen black, connexivum, two apical segments mostly, and the dorsal vitta yellow. Elytra shining black with a narrow pale margin; thighs lineated with brown, the pectoral pieces obscurely spotted with the same color. Pygofers short, truncated, viewed from behind broad, subtriangular, dorsal notch deep, rounded, reaching the ultimate dorsal segment, ventral notch shallow; stiles narrow, pointed, widely divergent, adjoining the ventral margin lying almost horizontal.

The female differs from the male in being of a duller color with the black markings paler and less extended The venter is somtimes entirely pale or touched with brown on either side. Oviduct black. Apex of the pygofers truncated, their inner angle slightly exceeded by the stout oviduct; plates rather short and broad.

Macropterous form: Elytra reaching for one third of their length beyond the abdomen; first sector widely forked somewhat nearer the base than the second; apical areoles seven, very irregular; nervures punctate. Wings whitish hyaline, nervures fuscous, the second white at base.

New York. Described from one male and six female examples taken near Buffalo from June 18th to July 31st. In form and ornamentation this insect recalls genus **Dicranotropis** to which it is further allied by the elongated apical fova of the vertex which extends well on to the base of the front, where, however it is very narrow, but it can hardly be placed in that genus.

In dedicating this neat little Delphacid to my friend Mr. A. H. Kilman of Ridgeway, Ont. I desire, in a measure at least, to express my appreciation as well of his scientific zeal as of his generosity in placing at my disposal the many valuable Hemiptera captured by him in Southern Ontario.

LIBURNIA CAMPESTRIS, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 191, 1894.

Brachypterous form. Male: Vertex nearly square, passage to the front well rounded, carinæ feeble, especially on the forehead, foveæ sometimes obscure; front rather broad, oblong, scarcely contracted between the eyes, sides feebly convex, apical margin straight; antennæ stout; apex of the scutellum abruptly subacute. Elytra narrowed and rounded at the apex, reaching to the ultimate dorsal segment, the sectors equally forked. Pygofers viewed from behind broad, rounded below, truncated above, sides a little produced on the middle, the depressed margins rather wide below the

anal tube; dorsal notch broad, reaching the ultimate tergal segment, ventral very shallow. Stiles divergent at base, parallel and somewhat expanded above, apex truncated, hardly attaining the anal tube. Color pale yellow; eyes, antennal setæ, the basal angles of the scutellum and a large pleural spot at the base of the posterior and intermediate feet black. Abdomen fulvous or rufous, tergum with a black basal area on each side of variable extent, or black with the margins, dorsal line and hind edge of the two basal segments rufous, venter rarely blackish. Pygofers pale, stiles black.

In the female the abdomen is larger and the elytra are shorter than in the male. The oviduct scarcely reaches the inner angle of the pygofers. Color a uniform dull fulvous, paler on the abdomen and legs; antennal setæ and tips of the tarsal spines black; oviduct obscured.

Macropterous male: Elytra extending one half their length beyond the abdomen, hyaline, nervures pale at base becoming brown toward their apex; apical nervures six, the second and third contiguous at base. Colors rather clearer than in the brachypterous form. Length, male 2 m. m., female 2½ m. m.

New York, Ontario. Described from numerous examples of both sexes; Buffalo and vicinity, May to August, Portage Falls, May 31st; Ridgeway and Muskoka, Ont. about August 1st. Mississippi, H. E. Weed; New Hampshire, C. E. Weed; Michigan, Davis. Here this pretty little species abounds in dry pastures especially where the grass is thin and parched during the heat of summer.

LIBURNIA LINEATIPES, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 191, 1894.

Brachyterous form. Male: Vertex almost square, carinæ sharp, fovæ distinct. Front rather broad, apex feebly concave, sides a little rounded, the lateral carinæ obscurely continued across the base, above which the median carinæ is divided on the vertex, below it is continued to the apex of the clypeus. Pronotum and scutellum minutely rugose; carinæ distinct, on the former the lateral carinæ approach the hind edge where they become obsolete, median carina of the scutellum abbreviated posteriorly. Elytra short, opake, subquadrate, reaching but little beyond the middle of the abdomen, nervures strong, the apical areoles hardly indicated. Basal joint of the hind tarsi distinctly longer than the two following. Last ventral segment deeply concave on its hind margin; pygofers with a deep notch below; aperture ovate, rather small. Stiles large, slightly widened before their conical apex, divergent above toward the anal tube and curved to correspond with the sides of the aperture to which they approximate, strongly ciliated. Color deep black; narrow edge of the frontal carinæ, last joint of the antennæ, inferior margin of the eye, pectoral pieces, edge of the connexivum, two basal segments of the tergum excepting a large discal spot, and the legs, fulvous or dull honey yellow; femora before with two longitudinal brown lines, behind with a dusky cloud; tibiæ with a brown line before; anterior and intermediate coxæ and the apical tarsal joint and a large spot on the post-pectus black.

Female: Entirely pale brownish yellow inclining to fulvous on the abdomen. Frontal carinæ margined with brown, tip of the rostrum and antennal joints dusky. Legs marked as in the male. Pygofers broad and short, subquadrate, their apical sinus rather deep; oviduct broad at base, black and slightly exceeding the inner angle of the pygofers. Length, male 2 m. m.; female, 2½ m. m.

I believe I have correctly placed the sexes of this species although I have never found them pairing. Though very different in color the form and markings are the same and they have always been taken in company.

New York, Ontario. Described from eight male and seven female examples taken near Muskoka Lake, Ont. about the first of August 1888 and a single pair captured at Lancaster, N. Y. early in July. This species can hardly be compared with any european species known to me.

LIBURNIA OCCLUSA, n. sp.

Small; black; front broad, oval. Length, male 1¾, female 2½ m. m. Brachypterous form. Vertex large, nearly square, seperated from the front by an obtusely carinated edge; carinæ prominent. Front broad, oval, truncated at the clypeus, width two thirds the length, carinæ distinct. Pronotum and scutellum thickly punctured, with an impressed point in each discal compartment, hind margin feebly angularly concave, apex of the scutellum obtuse, not abrupt, transversely rugose. Elytra hardly passing the middle of the abdomen, the two sectors about equally forked, abdomen with a dorsal carina; hind tibiæ bispinose.

Male: Black; carinæ of the head, narrow edge of the dorsal abdominal segments, apical half of the second joint of the antennæ, knees and tips of the tibiæ and tarsal joints, pale. Pygofers slightly contracted apically, ventral notch deep, narrow, dorsal broad, reaching to the ultimate dorsal segment; aperture rather narrow, subtriangular, the incurved margins broad below, fringed with long pale hairs. Stiles narrow, lanceolate, subacute and slightly fringed at apex, but little divergent above; ventral aspect of the anal tube produced each side in an obscure tooth.

Female: Piceous black; all the carinæ, apical half of the second antennal joint, calloused base of the front, disc of the frontal compartments, knees, tips of the tibiæ and the posterior tarsi their apex excepted, soiled white or fulvous. Pygofers broad and short, oviduct attaining the apex of their inner margin.

One macropterous female which seems to belong here has the scutellum large, convex, finely punctured on the sides, with the lateral carinæ obsolete and the apex somewhat abrupt. The elytra are a little longer than the abdomen, whitish hyaline, with strong piceous nervures, the fork of the first sector longer than that of the second.

Los Angeles, Calif. Described from one male and two female examples received from Mr. D. W. Coquillett (Nos. 191 and 192.) This little species is closely allied to **L. lineatipes** but aside from the male genital characters,

which are quite distinct, it differs in having a broader front and proportionately larger vertex, the legs are differently colored, the size is much smaller and the female resembles the male in color instead of being pallid as in that species.

LIBURNIA FOVEATA, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 192, 1894.

Pale yellowish, pleural pieces carrying a blackish spot and the femora lineated with brown, the front narrow, black with white carinæ. Length 2½ m. m.

Front rather narrow, contracted between the eyes, the sides straight below. Hind margin of the pronotum deeply concave. Scutellum short with an abrupt tip. Color soiled yellowish; front black with white carinæ; vertex with a black puncture in each fova; antennæ with a black point on the base of the second joint exteriorly; rostrum reaching the apex of the intermediate coxæ, pale with a black tip; disc of the coxæ and a spot on the pleural pieces blackish. Pro- and mesonotum entirely pale in the female, in the male the pronotum has a black line on the anterior margin behind the eyes and a cloud within the posterior angle, and the mesonotum has a black point exterior to the lateral carinæ. Abdomen of the male black, genital segment, a dorsal line widened behind and the connexivum whitish, the two basal segments of the tergum yellow with a black median spot. Abdomen of the female pale, more or less broadly clouded with blackish on the venter and sides of the tergum, the connexivum and a dorsal band pale, or at times the abdomen may be entirely pale. Legs pale, lineated with brown, apical tarsal joint black. Elytra narrowed apically, reaching nearly to the end of the abdomen, fork of the first sector slightly longer than that of the second, nervures obscurely granulated.

Genital characters. Male: Pygofers viewed from behind nearly circular, marked with a blackish transverse cloud; dorsal notch deep, partially enclosing the anal tube, ventral notch wide and moderately deep; stiles black, rather broad, nearly straight, suddenly narrowed at the apex, almost reaching the teeth of the anal tube, not widely divergent; anal tube produced in a blunt tooth at each lower corner. Female: Pygofers long, sides parallel, apex not very oblique, oviduct narrow, not attaining the inner apical angle of the pygofers.

New York, Ontario. Described from two male and eight female examples taken at Portage Falls, N. Y., May 30th 1888 and Muskoka Lake, Ont. in July of the same year.

In the form of the male genitalia this species approaches the european **L. distincta** as illustrated by Fieber, (Grundz. der Delph. tafl. 8, fig. 23) but the stiles are less divergent and the teeth of the anal tube are shorter In color these species are very distinct.

A single macropterous female which I have placed here differs from the female of **pellucida** in having a longer and narrower vertex, a narrower front with the sides straight below the eyes, the pronotum also is angularly excavated behind and the front is deep black ornamented with the white carinæ, and a black spot is always present at the base of the posterior feet.

LIBURNIA (?) INCERTA, n. sp.

Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 192, 1894.

Allied to **L. Bohemani** of Europe. Form and color of **lutulenta** nearly. Short and stout; frontal carina forked opposite the lower angle of the eyes. Length: Male 2, female 3 m. m.

Male: Dark testaceous brown; front obscurely rufo-piceous, tergum darker brown, the middle of the segments at base yellowish; pectoral pieces and legs soiled yellow. Aperture of the pygofers broad below, the stiles accuminate, widely divergent and curved at apex, lower edge of the anal tube forming a pair of acute incurved teeth which are approximate and gibbous at base.

Female larger; tawny or honey yellow, paler beneath; tip of the rostrum and oviduct black.

New York. Described from a single pair taken from a meadow near Buffalo on the 14th of June 1893. The forking of the frontal carina near the middle of the face recalls genus **Pissonotus** and the male is colored much as is that of **P. brunneus** but it is a much stouter little insect and the carinæ of the pronotum are curved behind the eyes.

LIBURNIA GILLETTI, n. sp.

Gillett and Baker, Hemip. of Colo., p. 69, 1895.

Brachypterous female: Color pale straw yellow marked with black. Carinæ of the pronotum and scutellum whitish, sides of the scutellum becoming almost a saffron yellow. Face excepting the carinæ and margins deep black; apical fova and a dot near the outer posterior angle of each basal fova on the vertex, the anterior angles of the pronotum exterior to the lateral carinæ and a small dot near the hind margin of the scutellum just within the lateral carinæ black. Abdomen black, outer margin and a dorsal line on the tergum, connexivum and pygofers pale yellowish; slender hind edge of the ventral segments and the stiles whitish. Legs and margins of the coxæ and pleural pieces pale, the femora and exterior edge of the tibiæ lineated with black; anterior, intermediate and tips of the posterior tibiæ brown. Antennæ yellowish brown with a black annulus on the base of each joint. Elytra oblong, rounded at apex and exceeding the abdomen, obscurely yellowish, subhyaline marginal nervures strong, yellowish, discal distinct, concolorous. Oviduct and anal stile black. In many examples there is a blackish dot on the disc of the pronotum either side of the median carina and the pronotum may be minutely dusted with dusky, or there may be a darker longitudinal cloud on either side of the median carina, or the disc of both may be black with the carinæ pale and the lateral margins yellowish or even fulvous. The macropterous females in the examples before me have the venter pale with a black discal cloud more or less extended: the sides minutely dotted with brown and bearing a row of black points, one on each segment, and the elytra are quite strongly clouded with smoky toward their tips.

The males are of a dead black color with the carinæ and sutures slenderly pale, at least on the face, the legs are more or less lineated with pale and the posterior tibiæ and tarsi are pale faintly tinged with brown, with the claws blackish. Apical half of the last joint of the antennæ pale brown. Elytra deep smoky brown becoming more transparent toward their tips, with brownish nervures.

In this species the front is oval and rather broad but more contracted between the eyes than in **lineatipes**. The vertex is truncated at base; the pronotum is rather deeply and angularly emarginated behind, the scutellum is short with an unusually large and abrupt apex which is rounded at tip and ecarinate, the median carinæ becoming obsolete opposite the lateral sinuses. The pygofers of the female are rather small and parallel and in the male the aperture of the pygofers has much the form it has in **pellucida** but the stiles are smaller and less divergent above, becoming nearly parallel at their base which is included within the ventral sinus of the pygofers.

Colorado. Described from many examples received from Prof. C. P. Gillette including both the long and short winged forms of both sexes. This is a very pretty and interesting species which seems to be quite variable in the extent of the black markings on the female. Like **pellucida** and **lineatipes** the two sexes differ widely in color.

GENUS ACHOROTILE, Fieb.

Fieber, Verh. der Zool. Bot. Ges. Wien, XVI, p. 521, 1866.
Cicad. d'Europe, I, p. 92, 1875; 88, pl. 8, 1876.
Sahlberg, Cicadariæ, p. 472, 1871.
Ashmead, Ent. Am., V, p. 27, 1889.

ACHOROTILE ALBOSIGNATA, (Dahlb.)

Delphax albosignata, Dahlb. Vet. Akad. Handl., 1850, p. 199.
Stal, Of. Vet. Akad. Forh., XI, p. 196, 1854.
Delphax fuscinervis, Dahlb., Vet. Akad. Handl., 1852, p. 113.
Ditropis albosignata, Sahlbg.. Cicadariæ, p. 472, 1871.
Achorotile albosignata, Fieb., Verh. der Zool. Bot. Ges. Wien, XVI, p. 521, 1866.
Fieber, Cicad. d'Europe, IV, p. 89, 1876.
Van Duzee, Bul. Buf. Soc. Nat. Sci., V, p. 192, 1894.

Numerous immature examples of this species were taken by me about a bog swamp at Concord, N. Y. in May 1888, and a few scattering specimens elsewhere. An examination of the mature form may show this to be distinct from the European species but it seems to me very unlikely that such would be the result.

PENTAGRAMMA, new genus.

Form broad, eliptical. Head nearly as wide as the pronotum, prominent and tumid before. Vertex broad, heptagonal, rounded at the apex which surpasses the eyes. Face convex, front nearly as wide as long, the two median carinæ widely divergent forming an oval compartment, approximate, parallel and indistinct over the tumid apex of the head; sides of the front broadly rounded, carinate. Cheeks mostly deflexed but with an oblique carina below the antennæ, forming there a sloping area. Clypeus large, convex, triangular, sides feebly carinate. Antennæ stout, subterete, first joint about one fourth the length of the second, oblique at apex. Pronotum shorter than the vertex, moderately concave behind, tricarinate, the lateral carinæ curved outward under the eyes. Scutellum normal, with five carinæ. Anterior and intermediate feet flattened, not foliaceous, posterior tibiæ a little longer than their tarsi, thickened at tip and armed with three spines on their outer edge.

This genus may be distinguished from any other yet characterized by the five scutellar and two frontal carinæ and the short basal joint of the antennæ. The type and only species now known is **Liburnia vittatifrons** Uhler, and of this I have seen only females. A study of the males may necessitate some change in the characters given above but they cannot unite it with any genus now established.

PENTAGRAMMA VITTATIFRONS, (Uhler.)

Liburnia vittatifrons, Uhler, Bul. U. S. Geol. & Geog. Surv., II, p. 351, 1876· IV, p. 510, 1878.

Standard Nat. Hist., II, p. 241, 1884.

This is our most conspicuous described North American representative of this group. It is a large green species approaching one third of an inch n length. The front is brown with a transverse green band, and against the antennæ is a black spot aad a larger one covers the inner disc of the anterior coxæ. The antennæ and legs are also lineated with brown.

Mr. Uhler records it from N. Y., N. J., Illinois, Dakota and Montana. On the Atlantic Coast it is an inhabitant of the salt-marshes.

Prof. Herbert Osborn (Proc. Iowa Acad. Sci., i, pt. 2, p. 127.) mentions a closely allied insect from Iowa but does not describe it as a distinct species.

GENUS STIROMA, Fieb.

Fieber, Verh. der Zool. Bot. Ges. Wien, XVI, p. 521, 1866.

Cicad. d'Europe, I, p. 8, 1875; II, pl. 8, 1876.

Edwards, Trans. Ent. Soc. London, 1886, p. 93.

STIROMA INCONSPICUA, Uhler.

Stiroma inconspicua, Uhler, Bul. U. S. Geol. & Geog. Surv., III, p. 458, 1877.

Gillette & Baker, Hemip. of Colo., p. 70, 1895.

So far this insect has been recorded only from Colorado. It is unknown to me.

Last June I took at Hamburgh, N. Y. a very immature little Delphacid evidently pertaining to this genus. It is pale yellow becoming brownish on the head and pronotum. Eyes and front black, carinæ white. The two median carinæ of the front are distinct and parallel through their whole length.

UNCERTAIN SPECIES.

The following species of doubtful position have been described from our territory:

Delphax vittata, Stal, Berliner Ent. Zeits., VI, p. 315, 1862.
Hab. Carolina, Pennsylvania.

Delphax producta, Walk., Homop. British Museum, III, p. 353, 1850.
Hab. Jamaica.

Delphax luteivitta, Walk. Homop. British Museum, III, p. 354, 1850.
Hab. United States.

Delphax unicolor, Walk. Homop. British Museum, III, p. 354, 1854.
Hab. Hudson's Bay.

Delphax pictifrons, Stal, Stal. Ent. Zeit., XXV, p. 50, 1864. (Hemip. Mex. No. 360.) Hab. Mexico.

Index to Vol. V.

Achorotile, genus.....259
" albosignata, Dahlb noticed.....259
Allygus costomaculatus, Van D., described.....207
Anas boschas, breeding habits of.....35
" obscura, breeding habits of.....35
Athysanus gammaroides Van D., described.....209
Avicula undosa, Ringb. described.....18

Birds, Nidification of, on the St. Clair Flats by Rev. *J. H. Langille*.....33
" Ventriloquial and Imitative Powers of, by *E. E. Fish*.....72

Callocystites tripectinatus Ringb., described.....12
Carterius latitenta Potts, note on.....104
" tenosperma Potts, note on.....104
" tubisperma Mills, note on.....104
Ceramopora orbiculata Ringb., described.....19
Ceratiocaris acuminatus Hall, described.....28
Chaetetes expansus Ringb., described.....20
Chondrites sp., noticed.....31
" graminiformis Pohl., described.....32
Conularia bifurca Ringb., described.....18
" multipuncta, Ringb., described.....18
" transversa Ringb., described.....19
Copicerus, genus.....230
" irroratus, Schwarz, noticed.....230
Crania dentata Ringb., described.....16
" gracilis Ringb., described.....17
" pannosa Ringb., described.....17

Day, David F.: Second Supplement to the List of Plants of Buffalo and Vicinity.....85
Delphacidæ, North American: A Preliminary Review of, by *E. P. Van Duzee*.....225
" " List of Species.....227
" " Key to the genera.....228
" " Uncertain species of.....261
Deltocephalus concentricus Van D., described.....208
" fuscinervosus Van D., described.....207
Dicranotropis, genus.....240
" maidis Ashm., noticed.....240

Earthworms the original hosts of the gapeworms of fowls.....47
Edwards, Austin M.: The Pendulum and Its Laws of Oscillation.....217
Erismatura rubida, breeding habits of.....36
Eugaster concinnus Ringb., described.....8
Eurypterus scorpionis Grote and Pitt, redescribed.....30

Eusarcus Grote and Pitt, not distinct from Eurypterus.....29
" grandis Grote and Pitt, same as scorpionis.....31
" scorpionis Grote and Pitt, redescribed.....30
Eutettix Slossoni Van D., described.....210
" Southwicki Van D., described.....209

Fish Remains from the Corniferous, near Buffalo. By *E. K. Mixer* and *H. U. Williams*.....84
Fish, E. E.: Ventriloquial and Imitative Powers of Birds.....72
Fossil Fishes of the Genesee and Portage Black Shales. Notes on. By *H. U. Williams*.....81
Fossil Fishes from the Corniferous Near Buffalo.....84
Fossils from the Niagara Shales, New Genera and Species of: By *E. N. S. Ringueberg*.....5
Fossils from the Waterlime Group Near Buffalo. By *Julius Pohlman, M. D.*.....23
Fulica americana, breeding habits of.....33
Fuligula americana, breeding habits of.....34

Gallinula galeata, breeding habits of.....34
Gape Worm of Fowls. Paper on. By *H. D. Walker*.....47

Hemiptera of Buffalo and Vicinity. A List of. By *E. P. Van Duzee*...167
" " Index to the genera of.....203
" See Preliminary Review of the North American Delphacidæ..225
Heteromeyenia repens Potts, note on.....104
" Ryderi Potts, note on.....104
Homoptera, Descriptions of New Species of. By *E. P. Van Duzee*.....205
Hydreomena Traversata Kellicott, described.....45
Hydrochelidon lariformis, breeding habits of.....37
Idiocerus nervatus Van D., described.....205

Kelisia, genus.....232
" axialis Van D., described.....232
" crocea Van D., described.....232
Kellicott, D. S.: Nonagria subcarnia n. sp. Note on.....40
" " Hydreomena traversata n. sp. Note on.....45
" " The Mills Collection of Fresh-Water Sponges.....99

Laccocera new genus, characterized.....241
" obesa Van D., described.....244
" vittipennis Van D., described.....242
" zonata Van D., described.....243
Langille, Rev. J. H.: Nidification of Birds on the St. Clair Flats.....33
Lecanocrinus excavatus, Ringb., described.....11
" incisus Ringb., described.....10
" nitidus Ringb., described.....9
" puteolus Ringb., described.....11
" solidus Ringb., described.....8
Lepidoptera, (Macro-) of Buffalo and Vicinity. List of. By *E. P. Van Duzee*.....105

Liburnia, genus.....246
" arvensis Fitch, note on.....248
" campestris Van D., described.....254
" consimilis Van D., described.....249
" detecta Van D., described.....248
" foveata Van D., described.....257
" furcata Prov., note on.....248
" Gilletti Van D., described.....258
" incerta Van D., described.....258
" Kilmani Van D., described.....253
" laminalis Van D., described.....251
" lateralis Van D., described.....253
" lineatipes Van D., described.....255
" lutulenta Van D., described.....252
" obscurella Boh., note on.....252
" occlusa Van D., described.....256
" ornata Stal, note on.....247
" Osborni Van D., described.....250
" pellucida Fabr., note on.....247
" puella Van D., described.....250
" Weedi Van D., described.....252
Lumbricus terrestris the Host of the Gape Worm of Fowls.....47

Megamelus, genus.....233
" Davisi Van D., described.....235
" marginatus Van D., described.....234
" notulus Germ., note on.....233
" piceus Van D., described.....234
Meycnia crateriformis Potts, note on.....103
" Everetti Mills, note on.....103
" fluviatilis Potts, note on.....102
" Leidyi Carter, note on.....103
" Millsii Potts, note on.....103
" Mulleri Lieb., note on.....103
" plumosa var Palmeri Potts, note on.....103
Mills, Henry: Collection of Fresh-Water Sponges, Notes on. By *D. S. Kellicott*.....99

Niagara Shales, New Genera and Species of Fossils from. By *Eugene N. S. Ringueberg*.....5
Nidification of Birds on the St. Clair Flats. By Rev. *J. H. Langille*.....33
Nonagria subcarnea Kellicott, described.....40
" obliquata, note on.....40

Onandaga Salt Group, Thickness of at Buffalo, N. Y.....97

Palaconiscus antiquus Williams, described.....84
" reticulatus Williams, described.....83
Pendulum and its Laws of Oscillation. By *A. M. Edwards*.....217
Pentagramma new genus, characterized.....260
" vitatifrons Uhler, note on.....260

Pentamerella compressa Ringb., described.....15
Phyllodinus new genus, characterized.....240
" nervatus Van D., described.....241
Pissonotus new genus, characterized.....236
" aphidioides Van D., described.....239
" ater Van D., described.....237
" basalis Van D., described.....238
" brunneus Van D., described.....239
" delicatus Van D., described.....237
" dorsalis Van D., described.....239
" marginatus Van D., described.....236
" pallipes Van D., described.....238
Plants of Buffalo, Second Supplement to the List of. By *David F. Day*.....85
Platyceras laciniosum Ringb , described.....14
" membranaceum Ringb., described.....15
" proclive Ringb., described.....14
Platycrinus corporiculus Ringb., described.....12
Platymetopius fuscifrons Van D., described.....206
" loricatus Van D., described.....205
Podilymbus podiceps, breeding habits of.....36
Pohlman, Dr. Julius: Fossils from the Waterlime Group near Buffalo, N. Y.....23
" " Thickness of the Onondaga Salt Group near Buffalo, N. Y.....97
Porzana carolina, breeding habits of.....38
Protaster stellifer Ringb., described.....7
Ptergotus bilobus Huxley and Salter, note on.....27
" Buffaloensis Pohlman, described.....24

Rallus elegans, breeding habits of.....38
Rhinopora curvata Ringb., described.....19
Ringueberg, Eugene N. S.: New Genera and Species of Fossils from the Niagara Shales.....5

Scaphoideus lobatus Van D., described.....211
" luteolus Van D., described.....210
Spirifer asperata Ringb., described.....16
Squmaster, new genus, characterized.....5
" echinatus Ringb., described.....6
Sponges, Fresh-Water: The Mills Collection of. By *D. S. Kellicott*.....99
Spongilla aspinosa Potts, note on.....102
" fragilis Leidy, note on.....102
" lacustris Linn, note on.....101
Stenocranus genus.....230
" dorsalis Fitch, note on.....230
" lautus Van D., described.....231
" palaetus Van D., described.....231
" saccharivorus Westw., note on.....232

Stiroma, genus 260
" inconspicua Uhler, note on 260
Stobera, genus 244
" bifasciata Prov., note on 246
" concinna Stal, note on 246
" tricarinata Say, note on 245
Stomatopora parva Ringb., described 20
" recta Ringb., described 20
Syngamus trachealis, paper on. By *H. D. Walker* 47

Thamnotettix aureola Van D., described 213
" perpunctata Van D., described 212
Tinobregmus new genus, characterized 213
" vittatus Van D., described 214
Tubella Pennsylvanica Potts, note on 104
Tuberculopora new genus, characterized 21
" inflata Ringb., described 21

Van Duzee, E. P.: List of the Macro-Lepidoptera of Buffalo and Vicinity .....
" " List of the Hemiptera of Buffalo and Vicinity 167
" " New Homopterous Insects 205
" " Preliminary Review of the North American Delphacidæ 225
Ventriloquial and Imitative Powers of Birds. By *E. E. Fish* 72
Walker, H. D.: The Gape Worm of Fowls; the Earthworm its Original Host. Also on the Prevention of the Disease in Fowls called "The Gapes" which is caused by this Parasite 47
Waterlime Group near Buffalo, N. Y. Fossils from. By *Dr. Julius Pohlman* 23
Williams, Herbert U.: Notes on the Fossil Fishes of the Genesee and Portage Black Shales 81

Xestocephalus new genus, characterized 214
" fulvocapitatus Van D., described 215
" pulicarius Van D., described 215
" tesselatus Van D., described 216

BUFFALO SOCIETY

OF

Natural Sciences,

REPORTS

THIRTY-FOURTH ANNUAL MEETING,

May 18th, 1894.

To the Buffalo Society of Natural Sciences.

Gentlemen:

Our Annual Meeting gives us an opportunity to pause a moment in our work, and note what we have done and what is most necessary to be done in the near future. The past year has been an uneventful one. We have suffered no great loss, and have made no startling gains. Our Museum and Library have been kept open to the public, and have been freely used. Our meetings have been fairly well attended, and some interesting discussions have taken place. Our rooms have been used by the Teachers' Association of the Public Schools of Buffalo, for a series of meetings, by the Electrical Society, by the Field Club, and by the Medical Society. The course of formal lectures given by our own Society during the winter, while the attendance did not pay the expenses, were interesting and instructive, and we may hope will bear good fruit in the future. We have not been able to continue our publication of the Bulletin, as we hoped to do at the beginning of the year. I would again call your attention to the importance of this matter, if we are to retain our position among kindred institutions. We are still receiving, every month, numbers of publications from other Societies, who, years ago, placed our name on their list of exchanges, and we are beginning to receive letters asking for our late numbers, thinking that as none had been received from us lately, we had either revised our exchange list or that our publications forwarded had gone astray. It is not creditable to our work or our position that we should allow this matter to rest in this condition.

The report of the Curator gives you in detail memoranda of the gifts and bequests to the Museum. We need even now more and better arranged case room for the proper display of our collections, so that they may be more easily studied. Our Library especially needs your attention. We have a large mass

of material, in pamphlets and other publications, which are absolutely inaccessible to the student in their present condition. They should be bound, catalogued and properly arranged in cases where they can be found easily by those desirous of consulting them.

Financially, our Treasurer's report shows that we are in much better condition than we were a year ago. Thanks to the generosity of Mrs. Robert P. Wilson, and of those who subscribed to the fund for the payment of the old indebtedness of the Society, we are practically out of debt. A few items, for which our treasurer has been unable to get the bills, are still unpaid, but the balance of the subscriptions now due will enable us, when paid, to settle them. We have lately received from our kind friend, Judge James M. Smith, the generous donation of $5000.00, to be used as, in the discretion of its Board of Directors, will be for the best interests of the Society. While it is the earnest wish of your officers to see the Permanent Fund of the Society, upon the income from which the growth and welfare of the Society in the future so largely depend, increased as rapidly as possible, it is a question whether, in the present condition of the Library and the Museum, a portion of this gift may not be advantageously used in bringing them more fully up to the requirements of those for whose aid we hold them. This matter is now receiving the careful attention of your officers.

In membership the Society has not grown during the past year. Offering the free use of our Museum and Library, as we do, to all students, the only inducement that is left to become a member of the Society is a desire to aid in the work for which the Society was formed and which it is doing. It is earnestly to be desired that all those who are interested in scientific work should feel their responsibility to aid in the maintenance of this Society.

In closing, allow me to extend my thanks to the officers who have assisted in the work of the past year.

Subscriptions to fund to pay the debt of the B. S. N. S.

H. A. Richmond,	$100.00
C. D. Marshall,	100.00
D. P. Rumsey,	100.00
E. G. Spaulding,	100.00
J. M. Richmond,	100.00
W. H. Glenny,	100.00
Wm. Hamlin,	100.00
Mrs. E. A Glenny,	100.00
J. J. Albright,	100.00
R. V. Pierce,	50.00
F. D. Locke,	50.00
J. H. Dawes,	50.00
Dr. Howe,	50.00
W. H. Glenny,	50.00
C. H. Williams,	50.00
J. C. Nagel,	50.00
A Friend (per W. H. G.)	85.00
Lee H. Smith,	25.00
W. C. Barrett,	25.00
P. P. Pratt,	25.00
Estate C. G. Curtiss,	25.00
F. Park Lewis,	25.00
A. T. Kerr,	25.00
S. M. Clement,	25.00
O. Reinecke,	10.00
Wm. McMillan,	10.00
A. R. Wright,	10.00
J T. Cook,	10.00
	$1550.00

Gentlemen:

Your Finance Committee would report that the balance on hand at the beginning of this year, as reported by

The Treasurer of the Permanent Fund was . .	$ 647.11
The Treasurer of the Society	166.10
We estimate the receipts of the year to be	
From Interest on the Permanent Fund . . .	1200.00
" Dues of Members	500.00
" Estate of Dr. G. E. Hayes	100.00
	$2613.21

From this amount we recommend at present appropriations

To the Library Association, for our share of expenses in this building	$ 500.00
For Salary of Curator	600.00
" " " Janitor	300.00
" Insurance	85.00
" Gas and Water	110.00
" Stationery and Postage	40.00
" Expense of Collecting Dues	25.00
" Publication of the Bulletin	125.00
	$1785.00

The Society also has on hand the gift of Judge Smith, of $5000.00. After a careful consideration of the needs of the Society, and a consultation with its officers, we recommend the appropriation from this sum.

To the Librarian, for binding of pamphlets, completion of defective volumes, and other work necessary to put the Library in good condition and render it accessible to students .	$ 850.00
To the Committee on Rooms for a reorganization of the Museum, general renovation of the rooms, new cases, etc. etc.	650.00
To the Permanent Fund Commission, for investment	3500.00
	$5000.00

H. A. Richmond.
Charles R. Wilson.
Henry R. Howland.

Buffalo Society

In account wit

MAY

1893.

May 9,	Balance from last report,		$ 36.28
9,	R. P. Wilson bequest,	$1,500.00	
12,	Hayes fund,	100.00	
12,	C. C. Hill, Treas. Lecture Com.	14.85	
	Dues,	522.25	
	Treasurer Permanent Fund,	1,400.00	
	Subscriptions,	1,550.00	
	Total cash received,		$ 5,087.10

$5,123.38

Natural Sciences,

A. Bull, Treas.

1894.

Jos. Metz,	$100.00	
F. K. Mixer (Salary)	450.00	
Mary McAlpin (Salary)	282.00	
Gas in Large room 78.84, in Com. room 22.36	101.20	
Water,	8.55	
F. Feyl (Kalsomining)	35.00	
Freight and Cartage,	5.93	
Photos and framing,	8.80	
Fixing locks,	1.75	
Labor and materials for fixing casts,	7.73	
Georger, Harries & Co. (Glazing)	7.50	
Collectors commission,	18.34	
H. Smith & Voss,	7.00	
John Lorenz,	1.90	
H. G. White & Co.,	21.49	
Postage Secy. 6.09, Treas. 2.90,	8.99	
Peter Paul Book Co.,	1.75	
F. P. Jones & Co.,	1.00	
J. W. Clement (Printing)	3.00	
Reinecke & Zesch "	20.00	
Cological Cabinet,	30.00	
Smith, Davis & Co.,	165.00	
L. G. Sellstedt for portrait Dr. Hayes	450.00	
Baker, Jones & Co.,	504.55	
Prof. Arey,	200.00	
Advertising Prof. Arey's lectures	15.80	
P. P. Burtis Treas. Buffalo Library,	2,500.00	
Total cash paid,		4,957.28
Balance on hand,		166.10
		$5,123.38

To the Buffalo Society of Natural Sciences:—

The Commissioners of the Permanent Fund of the Society submit the following Report for the year ending May 18., 1894.

At the date of the last Annual Report the principal of the fund aggregated $20,677.50 invested as follows:—

PRINCIPAL OF FUND.

Bond and Mortgage of	Lord & Inglehardt,	6%	. .	$3,500.00
" "	Francis A. Wade,	"	. .	3,500.00
" "	Emeline T. Husted,	"	. .	2,000.00
" "	Alice Collins,	"	. .	1,050.00
" "	L. A. Price,	"	. .	1.500.00
" "	George F. Francis,	"	. .	1,400.00
" "	A. J. Roehner,	"	. .	1,375.00
" "	R. C. Sage,	"	. .	1,100.00
" "	Edward P. Mills,	"	. .	2,000.00
" "	Caroline T. Beach,	"	. .	1,500.00
" "	Emily M. Waite,	"	. .	1,000.00
	Balance on deposit,	"	. .	752.50
				$20,677.50

The following sums have been paid in upon the principal of the Securities:

1894.			
January 4.	Principal,	R. C. Sage, B. & M. . .	$1,100.00
March 2.	"	Alice Collins, B. & M. . .	1,050.00

No additions have been made to the principal of the fund during the year.

Schedule B hereto annexed shows the present condition of the Permanent Fund and the manner of its investments.

INCOME AND DISBURSEMENTS.

The balance on hand to the credit of the income account at the date of the last annual report was $1.050.43. We have received during the year ending May 15th, 1894, on account of interest moneys $1.019.18, making a total of $2,069.61 as shown by Schedule "A" hereto annexed.

We have paid to the Treasurer of the Society since the date of our last report the sum of $1,400.00, and have paid $22.50 being for accrued interest on the T. L. Brady bond and mortgage purchased by the Society, leaving a balance of $647.11 on hand at the date of this report.

The following changes have occurred in the investments:— On June 1st., 1893, the sum of $600.00 was invested at 6% in bond and mortgage of Jane A. Martin on unencumbered property in the City of Buffalo.

On August 25th, 1893, the sum of $300.00 was invested at 6% in bond and mortgage of Henry Hitschler on unencumbered property in the City of Buffalo.

On March 15th, 1894, the sum of $1,500.00 was invested at 6% in bond and mortgage of T. C. Brady, on unencumbered property in the City of Buffalo.

Dated, May 18, 1894. CHAS. D. MARSHALL,
Treasurer.

Schedule "A" referred to in the foregoing report showing receipts of interest on account of the Permanent Fund and disbursements:

1893.			
May	12.	Balance of interest moneys an hand at the date of last report, . .	$1,050.43
"	12.	By interest of E. T. Husted, . .	15.00
"	26.	" " " G. F. Francis, . .	42.00
July	1.	" " " E. P. Mills, . .	60.00
"	14.	" " " Lord & Inglehardt, .	105.00
Sept.	5.	" " " E. T. Husted, . .	45.00
"	8.	" " " F. A. Wade, . . .	105.00
"	10.	" " " L. A. Price, . .	45.00
Nov.	3.	" " " E. M. Waite, . .	30.00
"	8.	" " " Alice Collins, . .	31.50
"	9.	" " " E. T. Husted, . .	15.00
"	13.	" " " C. T. Beach, . .	45.00
"	23.	" " " Jane A. Martin, . .	18.00
"	28.	" " " G. F. Francis, . .	42.00
July	1.	" " on deposits, . . .	8.28
Dec.	27.	" " of E. T. Mills, . .	60.00
1894.			
Jan.	1.	" " on deposits, . . .	3.44
"	4.	" " on R. C. Sage, . .	33.71
"	19.	" " of Lord & Inglehardt, .	105.00
Feb.	2.	" " " L. A. Price, . .	45.00
"	23.	" " " H. Hitchler, . .	9.00
March	2.	" " " A. Collins, . .	21.25
March	19.	By interest of F. A. Wade, . .	105.00
May	1.	By interest of E. M. Waite, . .	30.00
		Total.....	$2,069.61

DISBURSEMENTS.

1893.			
August	2.	To paid Treasurer, L. A. Bull, .	$1,000.00
1894.			
March	8.	To paid Treasurer, ...	200.00
"	15.	To paid accrued interest, Brady B. & M.	22.50
May	17.	To paid Treasurer, ...	200.00
"	17.	To balance on hand subject to call of Treasurer.	647.11
			$2,069.61

Schedule "B" referred to in the foregoing report showing the condition and manner of investment of the principal of the Permanent Fund.

Bond and Mortgage of		Lord & Inglehardt,	6% . .	$3,500.00
"	"	Francis A. Wade,	" . .	3,500.00
"	"	Emeline T. Husted,	" . .	2,000.00
"	"	L. A. Price,	" . .	1,500.00
"	"	George F. Francis,	" . .	1,400.00
"	"	A. J. Roehner,	" . .	1,375.00
"	"	Edward P. Mills,	" . .	2,000.00
"	"	Caroline T. Beach,	" . .	1,500.00
"	"	Emily M. Waite,	" . .	1,000.00
"	"	Jane A. Martin,	" . .	600.00
"	"	Henry Hitchler,	" . .	300.00
"	"	T. C. Brady,	" . .	1,500.00
		Balance on deposit,	. . . . .	502.50
				$20,677.50

May 18, 1894.

Your membership committee would report as follows:

Number of Members at beginning of the year,	176
Number resigned	11
Number elected,	5
Present Membership,	170

Respectfully Submitted

L. A. BULL,
Chairman.

The Lecture Committee beg leave to report that during the past year an effort has been made by the Society of Natural Sciences to continue its work as an educator by conducting a course of University Extension Lectures. There were ten of these given by Prof. Albert L. Arey of Rochester upon the "Forces of Nature; Electricity as related to Modern Life". It is to be regretted that these were not as well attended by members of the society as it was hoped would be the case, and financially they were therefore not as successful as a similar course proved a year ago. The society has the satisfaction, however, of seeing that great interest was manifested on the part of the young men who availed themselves of the opportunity and have every reason to consider that in this respect the lectures were a credit to the Society and to the one who delivered them.

In addition to this systematic course of ten lectures a few others have been given, but the efforts of the members have been devoted to continuing other courses affiliated with those of the society but not strictly belonging to it. It is suggested that a greater concentration another year would result in larger audiences and greater interest to both speaker and listeners.

Lucien Howe,
Henry R. Howland,
Herbert M. Hill.

P
Sci Buffalo society of natural sciences
B Bulletin. vol. 5, 1886-97.
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